MacUser

MAY 1991
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MacUSER LABS
6 FAX MODEMS: Clear choices for sharp faxes

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- **16 LASERJET OPTIONS:** Connecting Macs to HP printers

NEW!
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05

You do it by th

linking small.

When we introduced Microsoft® Word six years ago, we weren't planning on making history.

We had just one goal, and a fairly simple one at that: to make a word processor that suited people's needs.

Then again, we knew that the people we wanted to suit were a wildly diverse, independent lot: Mac® users. So it made sense to let them tell us exactly what to put into Word.

Which they did.

First, there were some folks who didn't like tabbing much. Fair enough. For them, we developed Tables—an easier way to set up side-by-side paragraphs, columns of numbers, even forms. No tabs. No hassle.

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Then there were those senders of mail, who didn't want to click-click-click-click-click-click. So we built support for Microsoft Mail right into Word. Now, with just a click, everyone stays in the loop. And work in progress *stays* in progress.

Apparently, listening to what people want is a pretty good way to design software.

How else can we explain Word 4.0 being the most popular word processor in Mac history?

And those cards and letters are still coming. "Listen," someone'll say. "In case you guys are working on the next Word…"

Which we are. In fact, if you've got some input for us, feel free to drop us a line. Or if you'd like to find out more about Word, call us at (800) 541-1261, Dept. N26.

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After all, we're only making history because we make word processors the way you like 'em.

Microsoft
Making it all make sense™

You don't become the most popular word processor in Mac history by thinking big.

MacUser

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Cover photo by Steve Underwood

90
Apple's two new budget printers bring
high quality to new lows — low prices,
that is.

137
Color gear:
monitors,
display cards,
and printers

348
John C.
Dvorak is
excited —
about
boredom.

51
What's
new from
off the
beaten
trackball?

MacUser

Design it to fit my hand

Put the button where I can reach it.

Light up the lock button so I know it's on

Silhouette

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MacUser

How to Reach Us

GO ZMAC
If you're a CompuServe subscriber, you can reach us on Zmac, the on-line service for *MacUser*. Just type GO ZMAC, or look elsewhere in this issue for information on how to sign up.

Product Announcements and Updates
Please send your letters or press releases about new products or upgrades to Michele Stokol, Assistant Editor, *MacUser*, 950 Tower Lane, 18th Floor, Foster City, CA 94404.

Help Folder
If you've got a Mac question or problem, send it to Help Folder, c/o *MacUser*, at the above address, or for a personal answer to your problem, type GO TECHSUPPORT on Zmac. You should also take advantage of local user groups. You can find the one nearest you by calling Apple toll-free at (800) 538-9696, ext. 500.

Tip Sheet
We love getting tips from our readers. Send your tips to Tip Sheet, c/o *MacUser*, at the above address, or type GO TECHSUPPORT on Zmac. We can't print every tip, but we'll try our best to pick the most interesting ones for publication.

Calling All Programmers
We'd like to hear from any programmer who is interested in contributing to our utilities disk or labs-benchmark disk series. If you're interested, contact Michele Stokol at the above address.

Writing for *MacUser*
If you have an idea for an article you'd like to write, we'd like to hear about it. Send a query letter with samples of your writing (published, if possible) to Nancy Peterson, Administrative Assistant, *MacUser*, at the above address, or type GO MACUSER on Zmac. No calls, please. We rarely buy unsolicited manuscripts, so don't send us a completed article without writing to us first. Allow four to six weeks for a reply.

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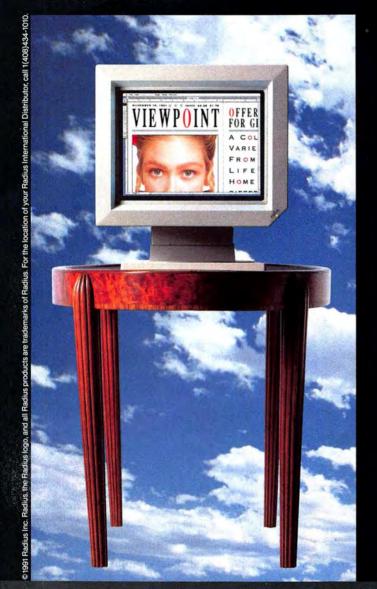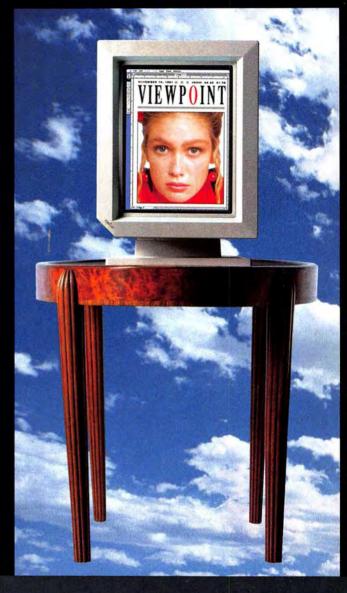
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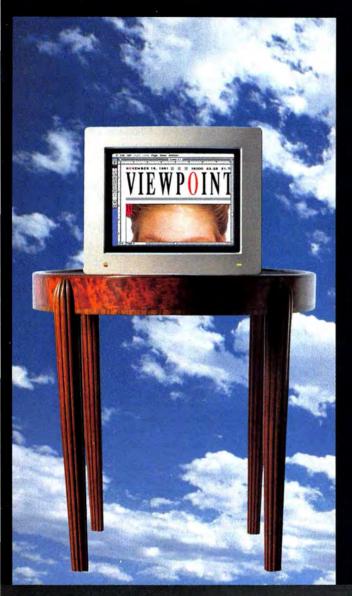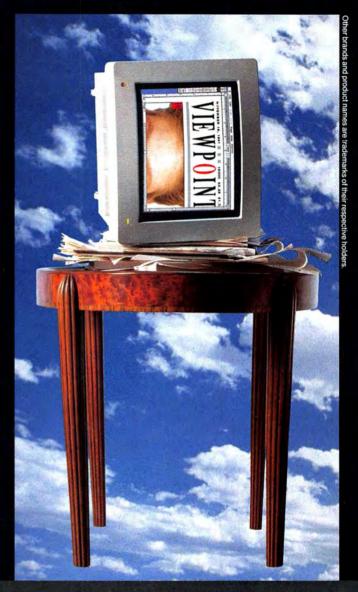
THE NEW COLOR PIVOT SHOWN IN LANDSCAPE AND FULL-PAGE MODE.

The comparison you see above is really no

comparison at all. ● If you live in a world

where things are all middle with no top or

bottom, or where the year has only six months,

you might choose the Apple. But if you would

like to see a full page of color graphics, and

see twelve months of spreadsheet instead of

merely six, and be able to go from portrait

to landscape with swift and deft ease, *and*

own the only color full-page display on the

THE APPLE 13" SHOWN IN LANDSCAPE AND...UH...PAPERWEIGHT MODE.

market, you will probably choose the Color Pivot needs no interface. But when all is said

Pivot." Okay, you will definitely choose the and done, perhaps the best thing about the

Color Pivot. ● The Color Pivot is compatible Color Pivot is that, well, it's a Pivot. ● For

with all color capable Macs. And on the Mac more information, or the location of your

IIsi and IIci with built-in video, the Color nearest Radius reseller, call 1 (800) 227·2795.

Tough Choices

What do *MacUser,* soccer, and chamber music have in common? Susan Janus, that's what. As *MacUser's* new reviews editor, Susan has the arduous task of sifting through the flurry of press releases and new products that descend on the magazine's offices each month. Choosing what's hot enough to review in *MacUser* requires instinct, experience, a stroke of inspiration, and a touch of mental anguish, reports Susan.

"Fortunately, I have help when I need it. We have a meeting of *MacUser* minds at least once a month to hash out what's new and important in Macdom, so I get to draw on the expertise of the entire editorial staff to assist me in making some of the toughest choices."

Before joining *MacUser* in January, Susan spent three years at *MacUser's* sister publications *PC Week* and *PC Computing.* However, she's no stranger to the Mac.

"In fact, I cut my computing teeth on the very first Macintosh, back in 1984. I still have a copy of the original Microsoft Word 1.0, which is fast becoming a collector's item. I also have

Our new reviews editor, Susan Janus, knows what plays well with Mac users — and what doesn't.

fond memories of PageMaker 1.0 — remember when system crashes were a way of life and text wrap was just a glimmer in Aldus' eye?"

What can make the job of reviews editor at *MacUser* so excruciating is the sheer number of innovative products the Mac platform inspires each year. "When I worked on the PC side of the industry, it was clear that most of the exciting new product developments in the Windows environment were inspired by the Mac. So it feels great to move to where most of the leading-edge ideas actually originate — in the Mac market," says Susan.

When she's not assigning and editing product reviews, you might find Susan picking turf out of her teeth ("I play in a very competitive, in-your-face soccer league — it keeps me tough enough to defend myself when a product gets a bad review") or relieving the tension of magazine deadlines with her violin and passion for chamber music.

What's on Susan's agenda for *MacUser* reviews?

"As reviews editor, I'll be continuing the broad product coverage that's kept *MacUser* readers informed on everything from the esoteric to the mainstream. One area I'll be watching closely is workgroup applications — software designed from the ground up for networked users collaborating on a project. This area will be key to keeping the Mac competitive in the 1990s. Since every Mac is shipped network-ready, I expect to see the most innovative development in this area happening first on the Mac. I've already taken a peek at prerelease versions of several cutting-edge products due to be released by this summer, so stay tuned."

LETTERS

Backdoor Macs

Guy Kawasaki really hit my desk accessory ("The Stealth Mac," February '91, page 41). How to sneak a Mac into a midsized government agency (approximately 15,000 employees)? Bury the computer police in a paper blizzard. It takes perseverance and a couple of trees to convince them that you think the way they do.

We learned that two words — *functional requirements* — reach deep into their psyche and, if the situation is handled diplomatically, can legitimize the purchase of a handful of off-brand computers. Six of us compiled a list of more than 250 functional requirements for our jobs as public-affairs specialists. Surprise! The Mac could handle 100 percent of our work — DOS was a distant second at 60 percent.

Dan Himsworth
Bozeman, MT

This letter is about getting Macs into DOS workplaces. I work for an electric company that is 100-percent DOS brainwashed. But it bought a fully equipped SE/30 and a IIfx for one of my projects — thanks to HyperCard and SuperCard and, of course, my astute application of them. In short, I sold the software, not the machine. Naturally the machine had to follow to make the software work.

The company had a database of sample data, but the numbers alone were useless. We needed graphics to show how the samples related to each other. Such phrases as "The database must have editable-graphics capabilities" did the trick. By *editable graphics* I meant that the program must be able to edit drawings without making users exit from it. This, I reasoned, was needed because it would waste time and effort to have to be constantly moving between programs. Which was true. We had a ton of work to do and little time to do it.

You can get Macs into the land of DOS with applications that only Macs can run. Stuff such as word processing and spreadsheets won't do it — but stuff requiring rapid-fire graphics might.

Bill D. Johnston
Cary, NC

Guy Kawasaki's "The Stealth Mac" column ends with the statement "a writer is supposed to portray things as they should be — not as they are."

His vision of the way things should be includes nine recommendations to lie and six ways to threaten lawsuits — in a column that's only 19 paragraphs long!

Where do Apple employees learn their ethics? Could the difference between the Mac and IBM PCs be the result of bad karma?

Milo
Balboa Island, CA

I looked in vain in Mr. Kawasaki's February article for evidence of tongue-in-cheek writing as he advised lying, misrepresenting, faking, and the like in order to sneak Macs into a

Dear Mr. Sculley . . .

If the Apple Portable proved anything, it's that you can't be too specific about your wish list. Who'd have thought that it would be important to say, "We want a portable Mac *that isn't too heavy to carry from one end of O'Hare to the other and that you can still see when a flight attendant turns off the cabin lights.*" When Apple gets around to unveiling a notebook Mac, wouldn't you rather not be disappointed?

Speak Up:
What features should Apple include in a notebook Mac?

✉ *Send your thoughts to Dear Mr. Sculley, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404.*

In October we polled for suggestions on what John Sculley can do to earn his salary — reported to be the highest of any computer executive. The answers were varied, but none of them beat Mr. Sculley's own: He's taking a self-imposed pay cut this year.

John Schubert, of Coopersburg, Pennsylvania, answered February's question of how Apple should provide **direct support for its customers** by first pointing out existing weaknesses. "The product can be baffling, the owner's manual is incomplete or cryptic, and your retailers are a bunch of crass goons." The answer? — "Interim solution is to help the individual customer. The long-term solution is to use customer-support problems as a database to fix the underlying problems. Accordingly, Apple should rotate product managers, technical writers, and sales managers from its customer-support telephone bank."

Barry Cohen of Brooklyn, New York, points his finger first at the computer buyer: "The real problem with the dealer channel is its unwillingness to pay for the services we require. Computers have become commodities like staplers and paper clips. Commodity products are sold at commodity prices, with a low profit margin for the dealer and little room for support services. We aren't willing to pay for dealer services by paying a higher price for the products or by buying service contracts."

LETTERS

company already set up with PCs. He certainly ruined his credibility as far as I'm concerned.

Unfortunately, there probably will always be smoothies who, on the surface, appear to be upstanding citizens while inwardly they are rotten to the core. When a judge was about to sentence a con man who had swindled many people out of large sums of money, he asked him, "John, how could you take advantage of those fine people who trusted you so much?" John looked the judge straight in the eye and said, "Judge, if they don't trust you, you can't swindle them."

Ernest Taylor
Winston-Salem, NC

I thought that my tongue wasn't in my cheek—it was poking through. I'll have to be less subtle in future columns, although of all things, I have never been accused of being subtle.

I believe that all people wear a moral beeper on their hip. We should try to get Macintoshes into our businesses but not set off these beepers.

By the way, Apple is not responsible for the development of my ethics. My parents and my wife are. I'm sure they would be happy to discuss them (or lack of them) with you. — GK

The Big Picture

Thanks so much for the article on full-page monitors ("Picture-Perfect Portraits: Full-Page Displays," February '91, page 176). As a Mac Plus owner for just one year, I've already grown tired of scrolling around as I'm working. I've been told by several local dealers that a Plus can't support using a larger screen. I read your article late at night and couldn't wait for morning to call the numbers you listed. Upon further investigation and a call to Mirror Technologies (Roseville, Minnesota; [612] 633-4450), I ordered a two-page monitor that will let me view programs in landscape and portrait modes.

Being what I like to call "computer stupid," I've only skimmed *MacUser* in the past. But now I find it's as easy to read as a Mac is to learn. I must admit, though, that I had to ask my secretary what WYSIWYG stood for.

William J. Farquharson
Duxbury, MA

Know When to Folder

I enjoy Thom Hogan's column but have a correction to the one printed in February ("Happy Birthday," page 297).

He says that programs should save preference files in a Preferences folder in their System Folder but that no applications currently do this. Two of my frequently used programs do actually use a Preferences folder. I suggest that you give kudos to Aladdin for StuffIt and to CE Software for DiskTop. StuffIt also generates other folders such as Help, Translators, and Viewers.

Harmon B. Abrahamson
Grand Forks, ND

CE gets an A, and Aladdin gets a B–. Creating three new folders with generic names in the System Folder is a no-no unless it's something other applications can use, such as Help or Preferences. Aladdin should create a StuffIt or an Aladdin folder for its Translators and Viewers. — TH

Speedy Optical Drives

In the audio section of your excellent multimedia report ("The MacUser Multimedia Encyclopedia," February '91, Buyer's Guide page 38), you state that erasable optical discs "would prove attractive if access times could be improved substantially" and refer interested readers to an optical-drive lab report in your November '90 issue ("Erasable Optical Drives," page 102), where you first noted their inability to handle the required access-speed needs of direct-to-disc recording and audio editing.

Oddly enough, when I received your November issue, I also received my direct-to-optical-disc Akai DD-1000 audio recorder/editor (International Music, Fort Worth, Texas; [817] 336-5114.) Our studio has since been recording and editing 16-bit CD-quality stereo audio with this system, which incorporates a standard Sony optical drive. It uses removable 650-megabyte cartridges.

The Akai DD-1000 seems to have no trouble with the optical drive's access time. It provides instant playback of any edited sound and equally speedy management of edit-decision lists. I never have to wait to hear playback, even if I'm assembling cuts from several different sound files. Best of all, Akai has selected the Mac as its computer interface.

Joe Van Riper
Charlotte, NC

The Akai product is a specialized $13,500 subsystem that uses a hefty 1-megabyte RAM cache. This speeds things up considerably.

In general, sound professionals' needs

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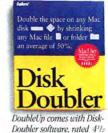
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LETTERS

are driving magneto-optical-drive evolution rapidly. For example, another audio-products company, Eltekon (Livonia, Michigan; [313] 462-3155), has rewritten the firmware and software of the same Sony drive that Akai uses and claims a transfer rate of about 309 kbps and access times of around 26 milliseconds — even without resorting to RAM caching. — LT

DOS-Chauvinist Mail

The main impediment to Mac users' taking advantage of the lowest-cost mailing offered by the U.S. Postal Service is that it won't accept Mac database disks unless they're in a specific DOS format. Why this blatant discrimination? The postal service claims there is not enough demand for a Mac option.

Mac users should be able to use this free upgrade to the ZIP+4 personal-mail lists. The Mac community should write to the postal service and their elected representatives if no action is taken. If all Mac database users would send the postal service a MAC address list in ASCII and request the advertised ZIP+4 free upgrade, we would make an impact and have our mail sent at the lowest possible cost — just as DOS users can do right now.

Niles A. Carter
Austin, TX

Share and AppleShare Alike

I challenge Henry Bortman's statement in the January '91 Bridges column (page 215) that "Mac users want file servers to look and act like AppleShare servers." Apple, not Mac users, wants file servers to look and act like AppleShare.

We want a file server that is either much easier to use — especially for file transfer — or that has much-more-sophisticated security. Some say that AppleShare provides easy file transfer, but I think TOPS, from Sitka, best meets these needs. Also, most mail packages let users transfer files painlessly. Neither of these methods requires an AppleShare interface.

On the other hand, network managers want mainframe-quality security and file management — especially multiple levels of security (not just groups and users); a way to automatically maintain past file revisions; and a way to access two accounts simultaneously from the same server.

David Medberry
Layton, UT

You've got a point. Although we could debate whether AppleShare or TOPS provides an easier interface for the casual

user, you'll get no argument from us about AppleShare's shortcomings in the security department. — HB

Safe Spin

Your excellent coverage of removable-data-storage disk drives and the benefits they offer Mac users ("Portable Secure Unlimited-Storage Cartridge Drives," February '91, page 206) contained some errors that might confuse readers.

The first issue is the hardware levels of SyQuest drives. Although a small number of revision 3 and revision 4 drives had performance problems, these occurred only when the drives shared the SCSI bus with a noisy scanner. We took immediate steps to fix the problem. The article's author was in error when he attempted to tie this issue to microcode levels.

SyQuest takes its obligations seriously. If users call our technical-support staff at (415) 226-4280 and their drive shows symptoms that are consistent with a noisy peripheral bus, SyQuest will simply exchange the drive.

However, more than 95 percent of all revision 3 and revision 4 drives have performed flawlessly. Since your article appeared, only six SyQuest drives have been returned because of this problem.

Linking the indicator color to the drive level can also confuse the reader. The worldwide change to orange was made more than a year ago to comply with the European safety standards that reserve red only for dangerous situations. All SyQuest drives have an orange indicator, and no changes are anticipated.

Joel Levine
Vice President Marketing
SyQuest Technology
Fremont, CA

We were in close contact with SyQuest for this report, but somehow we received some wrong information. We have no reason to doubt that the indicator light shows only drive activity and not revision level. Note that even if the version number of the drive contains the characters F5E, there is no guarantee that the drive is part of the problematic revisions. — AE

Hard Drive, Soft Rating

I am at a loss to understand your rating of the CMS MacStack SD45RM in your February review of cartridge drives ("Portable Secure Unlimited-Storage Cartridge Drives," page 206). Overall our drive scored very well in your tests. Your evaluation praised the good software and

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Like Garry Frenkel of *PC Week,* who calls MacTOPS and DosTOPS "...a complete networking solution...documentation is superlative...an excellent choice for those who want to get involved in some serious networking." Plus, Sitka* products have been honored with *Network Computing's* first-ever Well-Connected Award in December, 1990, the *LAN Times* Readers' Choice Award 1990, a *Publish!* Readers' Choice Award and a *Macworld Magazine* World Class Award.

Our comprehensive network includes true Mac-to-PC two-way file sharing, so files created on either computer can be shared by both. With print spooling that lets you keep working while your document prints. And MacTOPS comes with data file translators to translate files to and from different formats, such as Microsoft Word to Word Perfect or dBASE to Excel. We've also included a free copy of our InBox™ e-mail system—the application network users request most.

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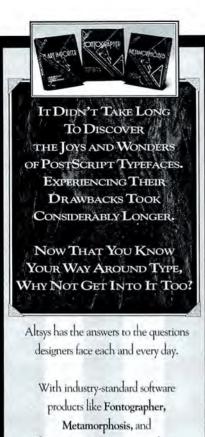
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LETTERS

excellent documentation. You also gave positive marks for the drive's metal cabinet, UL approval, and auto-switching power supply. Yet we received only two and a half mice in your article, which tied for the lowest rating in your article.

The only negative comment concerned our list price. Your chart shows $1,399, but we have retailed for $999 since early January '91. Quoted retail prices are close to meaningless for firms that sell only through resellers, because dealers demand certain points off retail and then sell at dramatic discounts.

In your previous comparison reviews, I have always clearly understood some relationship between the article and the final ratings — not this time.

Karl Seppala
Director, Apple Products
CMS Enhancements
Irvine, CA

Our speed tests for all SyQuest-based cartridge drives produced similar results, so performance differences had only a minor effect on ratings. The CMS MacStack SD45RM, despite its above-average speed, was faulted for having internal SCSI termination and DIP switches (instead of push-wheel or thumb-wheel controls) to set SCSI ID—neither are easily manageable by the average user.

The list price of $1,399 (which we considered high in the absence of features such as auxiliary AC outlets) was confirmed by CMS in late September '90. We're pleased that the price has been reduced—so pleased, in fact, that we've raised the CMS MacStack SD45RM's rating to three mice in this month's MiniFinders.

We agree that list prices can be misleading. Beginning in March, we started including "street" prices from across the country whenever possible, as a free market-research service. — BM

Safe at Any Speed

In January's "Thoroughly Modern Modems" (page 100), you reviewed 2,400-bps modems with error-correction and data-compression protocols. Can any of the 9,600-bps modems that use V.42/V.42bis use their correction and compression schemes at 2,400 bps when communicating with the modems you reviewed? If so, it means more justification for upgrading to the 2,400-bps modem with those protocols.

Doug Ivison
Westport, CT

All the 9,600-bps units known to us use error control and compression at 2,400 bps as well as at 1,200 and 9,600 bps. —SS

Upgrade Inflation

I have a couple of clarifications to Ken Gruberman's review of MacProteus, the music-sampling synthesizer on a NuBus card (February '91, page 54).

When you refer to a device incapable of sampling, a better term might be *sample playback* instead of *sampling.*

Also, Ken might be paying for his upgrades on Mark of the Unicorn's Performer too often. I bought Performer 2.2 in May '88 for $395. There were free upgrades on version 2.2. The version 3.0 upgrade appeared in the summer of '89 for $95, and it had two free upgrades. In fall '90, I got the version 3.5 upgrade for $69.

Each paid upgrade of Performer added new features and enhanced an excellent program. I found it to be money soundly invested.

Larry Mueth
Fenton, MO

A Talking Dog

Your review of Spyglass Dicer (February '91, page 60) accurately described the program and raised issues that we addressed in our latest free upgrade.

But we regret that you did not discuss the program's significance. It lets scientists visualize volumetric data on a personal computer in seconds, using inexpensive, interactive software that requires neither formal training nor programming. In fact, Spyglass Dicer is the only such application — as opposed to a programming environment — available on any computing platform. When you find a dog that talks, you should express some amazement at its ability before correcting its grammar.

Our users confirm that Spyglass Dicer has changed the way they do science. I think your readers should bear that in mind as they consider your comments.

Brand Fortner
Director of Research and Development
Spyglass
Champaign, IL

Spyglass Dicer is a revolutionary product—and indeed, so is the entire Spyglass line. Spyglass has brought mainframe capabilities to the Macintosh, but changing platforms also changes the user's requirements. Although a supercomputer is used only for computationally intensive

functions, the Mac can be used to visualize data while the user is writing a report, answering E-mail, creating a presentation, and manipulating a spreadsheet. Therefore, a function such as saving is essential to a Mac user but may not be to a supercomputer user. If Spyglass keeps in touch with Mac users' needs, its products should receive even wider acceptance. — RI

A La Carte Support?

Regarding Robert Wiggins' "Support Woes" column (February '91, page 29), why doesn't anyone point out that product support is *never* free? It doesn't take a rocket scientist to figure out that whether the vendor charges for it directly or not, the vendor still incurs exactly the same costs — such as overhead and salary to provide service for that caller. These support costs must come from customers who either pay for it up front when the product is purchased or at the time the call is made.

For example, the average toll-free phone call to WordPerfect costs the manufacturer $20. Let's assume an average of two calls, or $40, per package sold. The normal software discount to distributors is 60 percent, so the $40 in actual costs to WordPerfect translates to $100 added to the retail price. This means that even if you never use the toll-free support, you've paid as much as $100 more than you needed to when you bought the software.

I believe that if you buy an intuitively programmed package with a good manual, you should strongly support a per-call charge for product support. Otherwise you're just subsidizing users who call without reading the manual.

I do get irritated about paying for support on a per-call or contract basis. But I'd probably get over that irritation quickly if the prices of all my favorite programs dropped by $100 and the cost of support were unbundled.

Paul Zuzelo
Half Moon Bay, CA

That's a nice idea in theory. It would be especially nice for individual users, if only it worked that way. But in practice it doesn't. Separate support fees do not result in lower software costs. Software prices remain about the same, and support becomes an extra cost added to the already high product costs. Consider QuarkXPress and PageMaker, which already have a high price and also charge for support.

Business users also wouldn't fare well.

They would have problems getting purchase orders approved every time they needed support or subscription renewal. It's much easier for them to pay all costs in one chunk. —RW

Rein in Dvorak . . .

I'm writing to *MacUser* regarding one of your contributing editors, Mr. John C. Dvorak. I don't care what he thinks about the political side of Apple. I would much rather read his opinion on such matters as what really are the significant differences between Dvorak's PC and our Macs, why Apple's methodologies may or may not be inferior, and what is wrong with the pricing and technical-support policies of the Apple system.

His February column ("Apple Events," page 400) says so little and yet manages to fill a page. His style of critique is more than a little petulant, and it certainly displays poor upbringing. To say the least, it is impolite to deride someone's accent or facial mannerisms.

If you cannot corral his acerbic talents, then why not just drop him? I'm sure there are others, maybe less well known for their acidity, who could positively contribute to the debate between Apple devotees and IBM practitioners.

James A. Hauck
Pleasanton, CA

. . . Or Let Dvorak Reign

I've always wondered what it would take to incite me to write a letter to the editor. Now I know. John C. Dvorak's January column ("The Gloom and Doom Boom," page 346) did it. Often monthly essays are no more than a way to fill a page, and even the authors sometimes seem bored with the process.

Not so this time. Dvorak always makes us think, but this month's bonus was that he read my mind and eloquently told the whole world how I feel. Thank you and bravo!

Chuck Klein
Orangevale, CA

Clarification
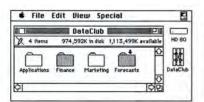
The review of Spyglass Dicer (February '91, page 60) overlooked the fact that the sample image that ships with it had its data prenormalized to a 1 – 255 range. So, contrary to what the review implied, Spyglass Dicer does retain the original value, which it displays whenever you click on a data element.

Our Newest Introduction.

Color monitor illustration by Rob Mageira.

Since 1985 Ehman has been a leader in providing high quality peripherals to the Macintosh market. Our hard drives, monochrome monitors, and removable drives have been a mainstay to the industry, with a name that is well known and highly respected.

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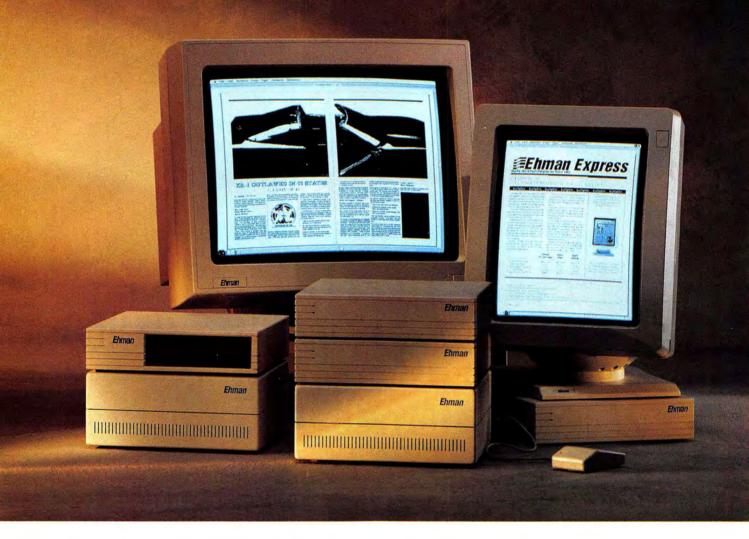
member of our family; 20 inches of 8 bit color in a high quality, 72 DPI monitor that end users will love, and budget watchers will adore.

The new Ehman 2-page color monitor. It's as affordable as it is practical. Backed up by a one year warranty and our 30 day money back guarantee the price tag once again demonstrates Ehman's commitment to value on the most popular peripherals.

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connector for a telephone system punch-down block.

The 10T Hub is just another example of networking leadership from Asanté, a company that brings you a full line of Ethernet cards for all Macintoshes. Like all Asanté products, our hub meets the IEEE Ethernet specifications and is compatible with all popular hardware and software. Reliability is guaranteed with our 5-year, hassle-free warranty.

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Please circle 37 on reader service card.

The Princess & the Printer

The decisions you face when buying a printer are endless: price, output quality, PostScript compatibility, and font strategies. . . . Will it ever be possible to print happily ever after?

Once upon a time — it may even have been yesterday — there was a magical kingdom called Cupertinia, presided over by the wise monarch King Macintosh, the User-Friendly. You could tell he was wise because he'd bought Apple at 29 ³/₄ — twice.

The king had a lovely daughter, Princess Classica. Classica spent her days skipping through the meadows of her father's kingdom, talking to the butterflies, singing enchanting little songs, and conducting anecdotal market research amongst the peasantry. She also ran a small desktop-publishing business on the side.

"Princess Classica! Princess Classica! Long live the beautiful Princess Classica," the adoring peasants would shout as she skipped by.

"Princess Classica! Princess Classica! When are we going to have an affordable, high-quality printer for less than $1,000?" the more pragmatic peasants would shout as she skipped by.

Princess Classica was no fool; she knew pent-up demand when she saw it. She also knew that although her popularity was riding high at the time, it wouldn't take much to lose the loyalty of her public.

The princess wanted nothing more than to keep the people of her kingdom happy. "Father," she asked the king, "our people seem happy right now. Yet to have a truly blessed kingdom, we must always stay one step ahead of their wish list. What should we do next?"

"You are wise, Princess," said the king. "Go see what the magicians in my Royal Skunk-Works have up their ample and mysterious sleeves." So off she went to the Royal Skunk-Works, in a remote corner of the kingdom.

"What can we build for you, your royal princessness?" said the Chief Engineer and Overall Cleverperson.

"I need a PostScript laser printer the masses can afford. That's the only way to fulfill the promise of Macintosh and keep the people happy."

"But, milady, they already have low-cost CPUs. The Macintosh Classic has become the single best-selling CPU model in all of computerdom."

"Yes, but what good is a CPU by itself? Most people still need hard-copy output. And they're not going to spend more money on the printer than they did on the CPU — or do you think money grows on trees?"

"Of course not, milady. Everybody knows money is printed on Rumplestiltskin's

Tektronix Phaser PX color printer. Why, all the details on this and other printers are conveyed in the current issue of *MacUser*, milady."

"Hmmm . . . I'll have to read that as soon as I get a chance."

The Chief Engineer continued, "I can make for you a 360-dpi inkjet printer for $599. It will be of the highest output quality, but it cannot be PostScript. The leaders of the land of Adobe will not share their PostScript magic with us — at least not at that price. But go forth, and tell the people the good news about the inkjet. In fact, it will be shipped just in time to be previewed in the current issue of *MacUser*."

The Chief Engineer went back to his workbench, and the princess went back to her market research.

"The printer is coming," she proclaimed. "What else do you want?"

"System 7.0! System 7.0! We want System 7.0!" the people shouted.

"Get real!" retorted the princess. "What do you think this is, a fairy tale?"

"Well," cried the people in unison, "how about if we could use the old VGA monitors we have hanging around from our old PC clones with our new Macintosh LCs?"

"Consider it done," said the princess. And even though the Royal SkunkWorks had not announced this fact with any fanfare, it was, in fact, true. "What else?"

"A single font standard!"

"Hmmmm . . . ."

Uh-oh, thought the princess. Fonts are intimately tied up with PostScript. This request, the princess knew, was beyond the ken of the Overall Cleverperson of the kingdom. So the princess headed off to visit an even cleverer person who lived in the neighboring kingdom, the ruler of the land of Adobe, the beneficent warlock Warnock.

Just a Fontasy

"Oh wise and wizardly warlock Warnock," cooed the alliterative princess, "my people pine for the pizzazz and practicality of PostScript printers."

"Verily, PostScript is, in sooth, a fine thing."

"But, your wiseness, PostScript is, in sooth, a fine and *expensive* thing. Oh, and they want you to clear up this confusing font business."

"'Tis true, your princessness. I require a substantial tithe, in sooth, to help capitalize my R&D costs for this fine PostScript."

"You are indeed a wise warlock, Warnock,

and a talented one — you are able to pronounce *tithe* and *sooth* in the same sentence. Someone that clever must indeed have some very fine improvements in store for PostScript; with all those tithes, you can afford the finest magicians on your R&D staff. Prithee, what glad tidings are we getting for our less-than-glad tithings?"

"Ah! Prepare to be amazed and astounded! Behold! A new font standard!!!"

"A font standard is, indeed, a wondrous thing. But is that what is needed to keep my people happy? You already have a fine and wondrous Type 1 standard. And with the mystical powers of the Adobe Type Manager — the ATM — you have rid our kingdom of the evil and vile jaggies."

"Did you ever notice that *evil* and *vile* are anagrams? Or that ATM is an appropriately chosen acronym for this utility that has dispensed much gold into our coffers?"

"Well," said the princess, "money doesn't grow on trees. But methinks you're changing the subject. Let's get back to fonts. My people were all happy with Type 1 fonts, once you opened the spec up to the other type wizards. And ATM elicited many a rousing cheer from amongst the people — including an Editors' Choice award from the scribes at *MacUser*. And, indeed, my own kingdom of Cupertinia is releasing its own new font standard — for the truest of all true type (described elsewhere in *MacUser*'s current issue). What for do we need *another* font standard? And what about the cheap printers we all want? The people grow restless and talk of visiting the distant land of the Windows people."

"Ah, princess, sit down, and I will explain all. Our new font technology is called Multiple Masters."

A Servant to Multiple Masters

"Consider how ATM does not limit you to just the particular type sizes your font supplier provides," quoth the warlock. "You can set the type size to any number of points, and ATM does the rest. Well, font vendors make some other rather arbitrary design choices — how heavy a font is, how italic its italics are, how serify or san serify it is, and so on. A Multiple Master font gives you control over a continuum of choices on all of these 'axes,' just as you now have continuous control over type size."

"This sounds powerful," said the princess, "but also complicated. My people want simplicity, not complexity. Suppose I'm using a font in a page-layout program and something's not working. There are too many things that could be responsible. How are my people supposed to keep track of these things?"

"Buy a clue, lady! We're just characters in a magazine column, after all. If life were that simple, nobody would need to buy magazines, and then where would we be?"

"I never thought of it that way," replied Princess Classica, wondering what René

Descartes would have to say about her situation. "But back to fonts. You've got your Type 1 fonts, you've got your Multiple Masters —"

"Multiple Masters is actually a type of Type 1 font," interjected the warlock.

"— which is a type of Type 1 font, and you've got your TrueType fonts —"

"Well, they're not *our* TrueType fonts. Those fonts came from *your* kingdom, princess . . . ."

"*Your* kingdom, *my* kingdom — what's the difference? My people are still confused. And when things get complicated, the peasants get revolting."

Prints and the Revolution

"Don't talk to *me* about revolting, princess: *We're* the folks who made all those 17-fonts-on-a-single-page documents possible. But not to worry."

But the princess *was* worried. "The world thinks the world of PostScript. In fact, there are lots of people who equate PostScript with all that is good about printing: high resolution, no jaggies, lots of fonts to choose from, rich graphics —"

"Yes, yes, PostScript gives you all of that and more."

"But you don't *need* PostScript for all that. You never did. There are many fine non-PostScript laser printers, non-PostScript fonts, and non-PostScript graphics programs. It's just that most printer manufacturers figured that anybody willing and able to pay the big bucks for a laser printer would want PostScript to boot."

"And boot it they did! Every time they boot up a PostScript printer, I can just hear those coffers clinking."

"But warlock! Our own magicians have just presented the people with a 360-dpi inkjet printer. That's an even higher resolution than that of most PostScript laser printers — and it lists for less than 600 bucks! And our new non-PostScript laser printer costs less than $1,300."
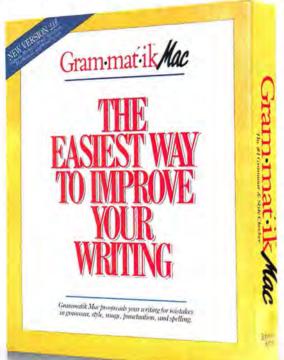
"Yes, yes, and the wizards from the distant kingdom of GCC have an even less expensive laser printer, listing at less than a thousand pieces of gold, with even better benchmark-test results than those of your own low-cost laser. I've already read MacUser Labs' current report. And not a farthing of those low prices goes for our pretty PostScript," moaned the warlock.

"Hmmm . . . I'd better get around to reading that issue," thought the princess.

The Princess and the P-Word

The princess was still confused about PostScript. Those new printers sound hot, thought the princess — even without PostScript. And a new font type can't hurt anyone — more options can only be a better thing, right? But Princess Classica left the land of Adobe in a state of greater confusion than she was in when she arrived. "I think I have a question," she mused aloud, "but I'm not even sure what it is anymore. This should be a happy day throughout the land. But methinks that all

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these new font choices will serve only to frustrate. Even more so, as I hear that a clone of PostScript called Bauer is coming posthaste from behind the castle walls of the supreme and utter wizards in Redmond, the masters of Microsoft."

"Aaaah, you don't want to enter *those* Gates," cried a gruff voice behind her. "I'll bet you two-to-one that *I'm* the wizard you need to see."

"Two-to-one? Well, those certainly are good odds, but —"

"Exactly! I'm the Wizard of Odds. Five'll get you ten that you've seen my movie?"

"Is that the one where everything is black-and-white until the Mac II arrives?"

"That's the one. I'm your chief odds-maker. See, nine times out of ten, the people don't need anything new to keep them happy. They think they need more than they have, but they really just need to solve their problems. And the key to problem solving is troubleshooting."

"Troubleshooting?"

"It's like dragon slaying; the secret is to eliminate the easiest opponents first. Nine times out of ten, that'll solve whatever problem you have."

"OK, Wiz, so what do we do?"

"The trick is to isolate the problem. If you can't get your printer to print, for example, try to print a very simple document — just text, no fancy fontwork, no graphics. If you can at least print a simple document, you've ruled out the causes of 90 percent of all difficulties: loose cables, printer out of paper, power off, and so on."

"That sounds fine," said the princess. "But what if the problems persist?"

"Most people think that problems crop up all on their own, but they almost never do. Usually they arise because you're doing something differently. Whenever you think you're doing *exactly* the same thing you were doing before, think again; chances are something is different. Because the Macintosh does such a fine job of keeping most of the annoying details of its operation hidden from view, it also makes it tough to see what the problem is when things go wrong."
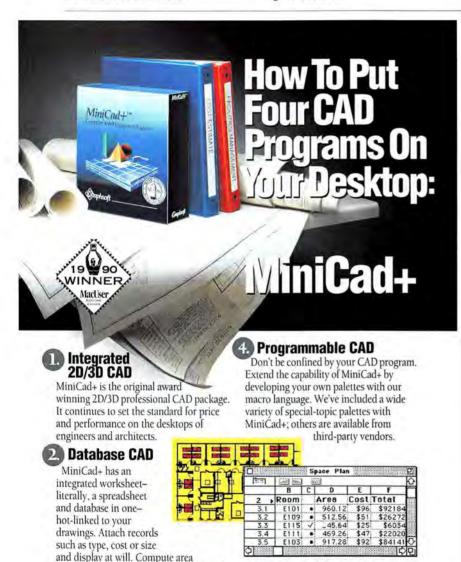
"Your difficulties probably have nothing to do with PostScript," continued the wizard, "or font conflicts, or the other perils that concern you. And once you've isolated the trouble, the solutions are usually obvious and easy. So go forth, and tell your people to embrace the new technologies and be happy."

The Morale of the Story

The princess thanked the wizard and returned to her kingdom. "What have you brought to keep us happy?" the people demanded.

And as the princess started to address her subjects, a smile began to spread across her face. "I have brought you the greatest gift of all: Nothing! No more choices to make for a whole month!"

And the people cheered and were happy — for a month.
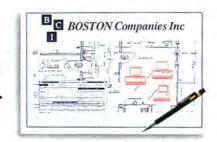
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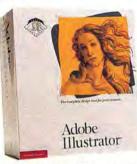
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Now you can buy the Adobe Type Library from NEC for an unbelievably low price. You'll get NEC's Type Gallery PS Locked Version and the amazing NEC Intersect CDR-36 CD-ROM reader. You can choose any three typeface families (up to a maximum of 15 individual typefaces) from nearly all 200 of the Adobe volumes. Plus, you'll save an average of 46% every time you call NEC in the future to unlock additional families.

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The Mac Zone carriers the entire Adobe font library call for prices.
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Smart Art 1 thru 4	58.
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Ares Software Corp.
Font Monger	62.

Dream Maker
MacGallery (HyperCard)	26.
MacGallery (MacPaint)	26.
Cliptures: Business Vol 1	68.
Cliptures: Business Vol 2	68.
Cliptures: Sports Vol 3	68.

T/Maker
Click Art
Business Cartoons	31.
Business Images	31.
Christian Images	38.
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EPS Animals And Nature	82.
EPS Business Art	82.
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Adobe Illustrator 3.0
Adobe Illustrator 3.0 is the premier product for single page design on the Macintosh. Adobe Illustrator 3.0 offers the highest quality design and illustration capabilities and now includes a powerful new text handling tool allowing for direct, on-screen entering and manipulation of text. Users can create and edit charts and graphs with ease while using new interactive dialog boxes for faster access to features. If this is not enough, every copy of Abode Illustrator 3.0 comes with Adobe Type Manager. Voted Product of the Year in InfoWorld.

Adobe Illustrator 3.0 ..... $348

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Streamline 2.0	118.

Aldus
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PageMaker 4.0	498.
Digital Darkroom 2.0	258.
Personal Press 1.0	198.
Super 3D 2.1	338.
SuperPaint 2.0	134.

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Fontographer 3.2	264.

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Kid Pix	31.
BannerMania	36.
Print Shop	34.
TypeStyler 1.5	114.

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Amazing Paint	64.
Calendar Maker 3.0	30.

Claris
MacPaint II 2.0	91.
SmartForm Designer	288.

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UltraPaint	124.

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DynaPerspective 2.0	599.

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Studio 32	448.

Frame Technology Corp
Frame Maker	795.

Koala Technologies Corp.
Mac Vision	258.

Letraset Graphic Design
ColorStudio	648.
ImageStudio	138.
ReadySetGo! 4.5	164.

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Capture 3.0	44.

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Swivel 3D Professional	438.
Swivel Art 3D	81.

Pixar
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Showplace	468.

Preferred Publishers
Exposure Pro	68.
Master Color	98.
MasterPaint 1.0	49.

Quark Inc.
Quark Xpress 3.0	518.
QuarkStyle	188.

Salient
Partner 1.01	55.

Softview
if:X Forms Designer 1.0	168.

Solutions
Curator	86.

SuperMac Technology
PixelPaint 2.1	148.
PixelPaint Pro 2.0	464.

Timeworks
Publish It Easy 2.0	144.

Ventura Software
Ventura Publisher for Mac	584.

Zedcor, Inc.
DeskPaint/ Draw 3.0.3	114.

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Architect	64.
Home Interiors	64.
Home Landscape	64.

Claris
Claris CAD 2.0	648.
MacDraw II 1.1	288.

Generic Software
Generic Cadd Level 1	83.

Generic Software
Generic Cadd Macintosh	374.

Graphsoft
Blueprint 2.0	218.
MiniCad Plus 3.0	594.

Innovative Data Design
Dreams	348.
MacDraft 2.1	278.

Versa Cad
Drafter	525.

Gold Disk Animation Works
Animation Works is a 1 to 8 bit, easy-to-use, path-based animation program. Objects are created in the CEL editor and then animated over static or scrolling backgrounds in the Movie Editor. Also available is the ability to add sounds, color cycling, multiple palettes, and looping control.

AnimationWorks $122

Media Lab PictureLink
PictureLink imports real-world full-color images (photos, artwork, 3D objects, anything!) into your database using a variety of methods. Scan into PictureLink directly from black and white or color scanners. Even grab real-world images in real-time from video sources such as cable TV, video camera, or other instruments. Use PictureLink to catalog images and data together for database applications where identification, documentation, and cataloging are essential. PictureLink "plugs into" 4th DIMENSION, resulting in seamless integration of real-world pictures within the database environment and greatly reduces the time required for importing and editing images into database records.

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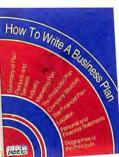
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How to Write a Business Plan $85

Creative Software Easy Color Paint 2.0
Easy Color Paint 2.0 will bring many colorful and fun-filled hours to your Macintosh LC or any Macintosh II. It's suitable for all levels of users: window locking for beginners, fancy menu options and a pressure-sensitive pen for pros. Print your masterpiece in color to the ImageWriter II or any Color QuickDraw printer. No wonder it's a Finalist for "Best Personal Creativity Program" in this year's Software Publishers awards. See for yourself what all the excitement is about.

Easy Color Paint 2.0 .... $44

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GEOvista $169

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TelePort plugs into your ADB connector, like your mouse and keyboard, eliminating a power adaptor, freeing you serial ports, and enhancing portability. TelePort 2400 baud Hayes compatible modem incorporated MNP5 data compression/error correction.

Teleport..........$128
w/ Send Fax....$184

Personal Training Systems
Personal Training Systems Courses are just like having your own private tutor. The courses are interactive, which means you work on your Macintosh using the real program as the instructors talk you through step-by-step. These audio-based courses are self paced and modular, allowing the learner to receive training at the most suitable level - beginning, intermediate, or advanced. Each course module is reusable, takes about 90 minutes to complete, and includes an audio cassette, example files on disk, and a quick reference card. The MacZone carries the complete line of Personal Training Systems programs. All Personal Training Systems Courses are unconditionally guaranteed.

Personal Training Systems ..... ea $51

WORD PROCESSING

A Lasting Impression	**Delta Point**	**Preferred Publishers**
Resume Expert .... 47.	Taste .... 83.	Vantage 1.5 .... 50.
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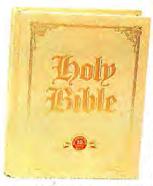
Aatrix	**Computer Assoc. - Bedford**	**Softview**
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THE WORD Processor 5.0 ...... $145

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NETWORKING & CONNECTIVITY

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MacCon SE E or ET .... 275.
MacCon SE/30 E or ET .... 340.
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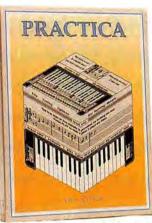
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ResumExpert $47

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Practica Musica 2.2 teaches you how to identify by ear two types of musical sounds, intervals, and chords. Version 2.2 now offers training for seventh chords and their inversion, plus advanced lessons in ninth, eleventh, and thirteenth chords. It also teaches the elements of music theory related to intervals and chords. Your Mac serves as the ever-patient drill instructor. It plans either through the Mac's sound chip, or any MIDI synthesizer. Includes Windows on Music, a coordinated music fundamentals toolbox.

Practica Musica 2.02 .... $68

EDUCATION

Addison-Wesley
Inside Mac Vol 1 - 5 .... 18.
Inside Mac X-ref .... 8.
MacProgramming Primer .... 21.
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Hyperglot Software Co.
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QLTech Giga-Rom, Macademic, or CD7

Giga-ROM is the largest collection of Macintosh software ever assembled. Files are archived in Bill Goodman's "Compactor" format and indexed with On Location. Macademic is 7,500 programs and related files for Education and Instructional use. Subjects range from the arts to the sciences. CD7 is The largest non-compressed collection of Macintosh software. Over 15,800 files including art, games, demo, and music files with digitized sounds.

Giga-Rom $98
Macademic $73
CD7 ....$49

Call for products not listed

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Mac Tools Deluxe
Mac Tools provides utilities for data recovery, file protection, and disk management. You can make backups of your hard disk whether on Apple tape drive or a set of floppies. Other utilities in the collection undelete accidentally-erased files, recover damaged files, compress files, defragment files, and encrypt them. A DA finds "lost" files fast.

Mac Tools Deluxe $78

DATA RECOVERY
HARD DISK BACKUP
DISK OPTIMIZATION
FILE MANAGEMENT

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ASD Software
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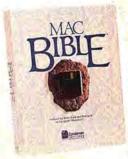
FileGuard $138

BUSINESS & PRESENTATION

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ZonderVan macBible presents several different versions of the Bible to help you understand its meaning more clearly. macBible quickly finds the passage you want to study. It can open five text windows and one special purpose window at once. Three study modes open the Bible to your questions. The word-and-phrase mode locates individual words, phrases, and groups of words. The verse modes displays any range of verses by book, chapter or verse. The Count mode displays statisitical information about words or groups of words to complete your study.

macBible $58

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Timeslips III for the Mac is the ultimate time tracking and billing software system. With it you'll find that your workday is being spent more productively, and that your billings are much more complete. The features and functions are so simple, they practically run themselves.

Timeslips III ... $194

UTILITIES

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WACOM - Graphic Tablets
Complete line available ...... Call.

Brøderbund
Kid Pix
Kid Pix is an amazing paint program created just for kids. It combines special effect art tools, picture stamps, sounds and magic screen transformations to turn the computer into a magical art studio. And with Kid Pix, you don't just paint a masterpiece, you hear it too! Every brush and tool has its own unique sound effect. You can even record greetings, poems or music to enhance your creations.

Kid Pix $31

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Throughout the history of computing, years of effort and millions of dollars have been spent in pursuit of the perfect input device. Keyboards, light pens, joysticks, trackballs, mice, and more have all been tried. Only the keyboard and mouse have showed true staying power.

More recently, OCR (optical character recognition) software and even handwriting-recognition software have made news. But as fads and fashions have come and gone, one technology has remained elusive: the Holy Grail of input technology — voice recognition.

Visionaries have long predicted the coming of voice-controlled computers. Even the most jaded user would agree that truly efficient and effective voice recognition would make computers more accessible (John Dvorak might not agree, but he's more jaded than most).

As the Mac is to a character-based system, a voice-controlled system would be to the Mac: a true computer for the rest of us. Every user — and even potential user — who has ever watched "Star Trek" has yearned for a voice-activated computer like the Enterprise's.

Although highly advanced voice recognition is still a few years away, voice recognition is already here. Like many innovations, it didn't come from a giant corporation — it came from a modest startup company, Articulate Systems, which is committed to advancing this technology.

Articulate Systems has been unusually successful at getting recognition for voice recognition. The 1989 *MacUser* Editors' Choice Award for most significant hardware product went to Voice Navigator (see "Editors' Choice Awards," March '90, page 92), and the 1990 Eddy for best input device (see "The 6th Annual Editors' Choice Awards," March '91, page 97) went to Voice Navigator II, which is smaller, less expensive, easier to use, more versatile, and more advanced.

A Sound Product

Although Voice Navigator II falls short of Mr. Spock's standards, it's a good start. You can't use it as a dictation device, and the technology is a long way from that level. For some time, the keyboard will remain the primary way to get words into your Mac, with scanners and OCR a practical alternative for inputting large quantities of information.

Voice Navigator excels with short phrases such as commands, making it a mouse alternative rather than a keyboard replacement. You can execute menu items without ever lifting your fingers from the keyboard.

Voice Navigator can also serve as a mouse extension. Have you ever been working in a program with a tool palette (such as PageMaker) and wanted to change tools without dragging the mouse all over the screen and back? This product lets you say "pointer" and the cursor instantly switches to the pointer function. If you have a large-screen monitor or a multiple-monitor configuration, this feature alone makes Voice Navigator worthwhile.

You can link Voice Navigator to various actions, which is rather like using a macro-recording program such as QuicKeys. There are also add-ons such as VoiceWaves, a collection of macrolike instructions for specific programs. To implement VoiceWaves, you simply teach it to recognize your voice.

For Offices, Not Cubicles

Although Voice Navigator is an excellent product, voice recognition is no panacea. John Dvorak has described a sea of desks occupied by people talking to their computers. This conjures up images of offices where the air rings with "No, don't type THAT!" and "Don't listen to HER, listen to ME!" He has a point. Voice-input products are not suited to open-office environments. Voice Navigator's sensitive microphone, for example, although somewhat directional, occasionally picks up extraneous sounds that it treats as commands. Background noise can sometimes mask your voice, rendering the product less useful. Having to repeat commands can get old fast.

In addition to the technical problems of background noise, voice recognition presents psychological problems. Some users feel self-consciousness when talking to a computer, especially if others can hear them. Even if the technical problems are solved, voice recognition is likely to remain more of an option for people who have some privacy.

There's also a problem with yelling. When misunderstood, people tend to repeat themselves more loudly, especially when they're giving commands. This has two effects. For one thing, your voice is different when you shout, so the louder you speak, the *less* likely the hardware is to understand you. This leads to a cycle of shouting louder and louder, which can be like dealing with a petulant child who refuses to obey you until after you've calmed down. When you've regained a normal speaking voice, your commands are recognizable

and are thus obeyed once again.

There are tricks that help overcome some of these problems. You can nest commands so that it takes two or more commands to execute an action. This prevents commands from being executed accidentally when you're talking to someone else or you're on the phone and don't realize that the computer is listening. This is an excellent idea if you plan to implement commands such as Erase Disk or Shut Down. Of course you can get even greater safety by not teaching Voice Navigator such commands.

Another trick takes advantage of the way Voice Navigator II uses three samples of your voice to learn a command. If you use three different volume levels (or distances from the microphone) when recording your samples, you increase the probability of being recognized when you raise your voice or move around.

A Sound Future

At the current level of technology, voice recognition has moved beyond novelty into the realm of utility. It is now more than a toy. After you're used to the Voice Navigator, you won't know how you lived without it. You can also visualize how much further voice recognition can go.

Voice recognition can make changes in the way you do business. Some changes may be for the better, such as an integrated voice-and-electronic-mail system or the ability to control your Mac remotely via telephone. This capability would let you call your Mac and have it fax an important document to wherever you are in the world.

Other voice-recognition-related changes can be costly. Open offices and cubicle systems are less practical if everyone is talking all the time, for example, so expect to need better soundproofing. Offices may even have to be redesigned.

You can bet that voice-recognition systems will play an increasing role in the proliferation of computer systems. As technology advances, costs decrease, and software that exploits new capabilities is developed, voice recognition will become an integral part of the concept of computing. When you can turn to your computer and instruct it, "Get that guy from Cleveland on the phone, and show me the Chicago figures" and have it not only understand your oblique references (What guy from Cleveland? Which Chicago figures?) but also obey you instantly, voice recognition will have enabled the next computer revolution. ▣

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In Praise of Prodigy

Prodigy, the easy-to-use (albeit leisurely) electronic-communications service sponsored by IBM, has turned out to be a chip off the old block — but is that actually bad for Mac users?

Dear Editor: I was vastly disappointed by Guy Kawasaki's column regarding Prodigy in your May issue. His column was filled with technical errors, misinterpretations of our actions, and illogical and unsupported conclusions about our very fine advertising service.

He, like many other people, does not understand Prodigy's purpose: To serve as an advertising medium — not as a channel of communication. As an advertising medium, we have every right to run our service as we see fit for the majority of our subscribers.

William Whitebread
Prodigy Services
Upstate New York

(I know that this month's column will generate this kind of response from PR flacks or Prodigy executives. Rather than give them the satisfaction of writing this letter, I thought I'd write it in advance. Foiled again, IBM.)

This month my column is about Prodigy and its recent actions to control its subscribers. To make a long farce short, Prodigy is an electronic bulletin-board system created as a joint effort by Sears, IBM, and CBS. (CBS dropped out later when Brent Musburger couldn't figure out how to sign on to the system.)

A controversy recently erupted between Prodigy and some of its subscribers because of Prodigy's censorship of public messages, initiation of charges for private E-mail messages when they exceed a certain quantity (initially E-mail services were free, but then the volume got too large, so Prodigy changed its mind), and termination of a few dissident members.

As you would expect, the computer press has leapt up and condemned Prodigy for these kinds of actions and alleged actions. Highly respected gurus such as Steve Levy and Jean-Louis Gassée have trumpeted human rights, free speech, and plain old common sense loudly in *Macworld* and *MacWEEK*. Can I tell you something? They've got this all wrong — Prodigy has done a great thing for Macintosh.

The Prodigy Way

How's that? Well, Prodigy has given the Macintosh community concrete, irrefutable, and powerful evidence of Prodigy's (and by extension, IBM's) philosophy of personal computing. This philosophy of control and censure is completely contrary to personal computing's raison d'être: empowerment, communication, and creativity. It's wonderful ammunition to use against the IBM PC and everything it's come to stand for.

Prodigy wants to control things, and it's perfectly within its right to do so. But you have to wonder what it thinks of personal computing. To me, it's scary, and I would never buy a personal computer from a company that had started a company such as Prodigy. The fruit never falls too far from the tree, as they say.

Think about it: The next time you hear, "I'm thinking of buying an IBM PC," you don't have to limit your retort to the standard stuff: "The Mac's easier to use and has cooler, nicer columnists and better software." Now you can say, "IBM believes in censorship and bait and switch. It's un-American to buy an IBM PC."

Clearly this is an oversimplification of the situation, and Prodigy has its own side of the story. But don't lie awake at night awash in guilt. For years, IBM has portrayed the Mac as a wimp machine without software. Two can play at the Fear, Uncertainty, and Doubt game. Now it's our turn.

Not Far Enough

Frankly, for our purposes, Prodigy may not have gone far enough. Maybe it should go *further* to inflict its vision of personal computing on its customers. Surely saying this will bring a rain of criticism upon me, but only good can come of it: Prodigy will decide to get even tougher and more draconian and antagonize more people, which is good for Macintosh. Or it will lighten up and tolerate more controversy on its service, which is also good for Macintosh.

If Prodigy decides to go the first route and get tougher, allow me to suggest some ways for it to achieve this goal:

1. Screen and edit every message. I mean *every* message: public, private — even unsent ones. In fact, it would be good if Prodigy could read its customers' minds to see if they are *thinking* about sending a controversial message. There must be a way to do this through a new kind of keyboard membrane. IBM always seems to excel at keyboards.

2. Administer personality tests to prospective customers. Prodigy should prevent problems before they happen, so before people can join, they should have to complete a test, get it notarized, and send it to Prodigy. They should be accepted only if they pass Prodigy's requirements. Joining Prodigy should be as difficult as joining MENSA — and as useful. (Oh no, here comes more hate mail. This time from MENSA members who own guns and just escaped from Singapore.)

3. Detect if a person who accesses Prodigy with a Mac works for a company that has standardized on the IBM PC. On detection, Prodigy could furnish lists of offenders to the Mac users' bosses. Corporate America would surely appreciate Prodigy's efforts to ensure that its employees use only IBM PCs.

4. Make Prodigy run s-l-o-w-l-y on Macs. This perpetuates the belief that Macs are slow compared with IBM PCs. It will also drive away Mac owners and keep Prodigy pure — safe from the anarchists that we Macintosh owners are. (I hear that this recommendation has already been implemented.)

What You Can Do

So far I've focused on how Prodigy can drive customers away from its service and IBM. You can have a hand in this guerrilla operation too. Here's what you can do to help the Macintosh cause:

1. Join Prodigy if you're not already a member. (I never said that helping the Mac cause would be without sacrifice.)

2. Send mail to the Prodigy system operators complaining that your children have read obscene, distasteful, and inappropriate messages on the service.

3. Send mail to the Prodigy system operators threatening to boycott the Prodigy advertisers' products because they are implicitly supporting immoral electronic communication. (This is the nerd version of the boycott of advertisers on the "Married with Children" television show.)

4. Cancel your membership.

I think this would drive Prodigy nuts. It would crack down even harder on dissidents. This would then antagonize more people. It would make Macintosh more attractive. It might even make Apple more attractive.

But Seriously, Folks . . .

Seriously, I hope that Prodigy lightens up and takes a more hands-off attitude. It's just not a cool way to run this type of service. Don't tell me Prodigy is an advertising medium. Prodigy is a public bulletin board like CompuServe and America Online. It walks like a duck, it looks like a duck, it sounds like a duck. It *is* a duck.

Really, more than anyone, I want more people to buy Macs and not IBM PCs, but I don't want people to do so because Prodigy (and therefore IBM) is so backward. See, when you're on the winning team, you must play with a certain amount of grace. Not to mention modesty.

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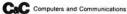
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* PC-VCR compatible with any Macintosh or IBM (and 100% compatibles) computer system with one megabyte of memory, 640K of base DOS memory, plus 384K extended, not expanded, memory. ** Sold separately.

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$300 to $600.*

By Russell Ito

The 68040's year: Now that the low-end Macs are out, attention is turning to acceleration, specifically 68040 acceleration. Motorola's 68040 packs more than 1.2 million transistors — four times as many as on the 68030 — and consolidates on a single chip a math coprocessor, paged-memory-management unit, and data and instruction caches that are 16 times larger than those on the 68030. As a result, the 68040 is nearly twice as fast as a IIfx (15 MIPS versus 8) and 12 times as fast in simple floating-point calculations (3.6 MFLOPS versus 0.3). Four manufacturers have jumped on 68040 acceleration early. ➡ Radius' Rocket will be the first shipping unit. A NuBus card, it has a unique design that lets the 68040 take over the CPU functions, leaving the Mac CPU (68020/030) to handle all the I/O. The Rocket uses standard SIMMs and can be configured with 1 to 128 megabytes. Radius' software takes advantage of NuBus block transfer, so the Rocket can pass data across the NuBus at rates up to ten times faster than those of most other NuBus cards. Plus the Rocket has its own PDS (processor-direct slot), so fast daughterboards can be added. Radius has even included QuickDraw and display-list acceleration, in software, so the Rocket takes care of graphics acceleration too. The Rocket is expected to list for less than $4,000. (408) 434-1010. ➡ iir's NuBus card, the Performance/040 Accelerator, is similar to the Rocket. It also leaves the Mac motherboard active to handle I/O functions and uses standard SIMMs. Second-quarter release. $3,995. (404) 781-8643. ➡ Fusion Data Systems goes the PDS route, letting the 68040 take over the Mac completely. The TokaMac LC is a PDS card for the Mac LC that uses the Mac motherboard's RAM while boosting the LC's performance beyond that of the IIfx. Second-quarter release. $2,995. (619) 481-8427 or Charles Allen (619) 457-0781. ➡ Total Systems Integration's Magellan 040 is also a PDS card, only this time for the SE/30 and IIsi. It too uses the motherboard RAM. $2,995. (800) 874-2288.

Up to Date . . .

Studio/8, Electronic Arts' 8-bit-color painting package, has just had its first major upgrade. Version 2.0, which has been revised for the Mac IIsi and LC, now supports the Pantone Matching System and additional file formats. $295. (415) 571-7171. ➡ Electronic Arts has also dropped the price of Studio/1, its black-and-white painting package, to $79. ➡ Inspiration, Ceres Software's "thought processor," is now in version 3.0. The latest edition boasts color and improved graphics. $249. (503) 245-9011. ▣

The QMS-PS 2000 is a fast (20 ppm), big (up to 11 x 17 inches), 300-dpi, black-and-white printer that's ideal for mixed networked environments.

QMS' Fast Departmental Printer

The speed of PostScript printers has been increasing nearly as fast as the price has been coming down. The Kodak Ektaplus 7016, which we described here last month, points the way to output integration, and the QMS-PS 2000 takes pure laser printing to new performance levels.

The QMS-PS 2000 is a 300-dpi, 20-ppm (pages per minute), Mips R3000 RISC-based PostScript unit that can handle paper sizes of up to 11 x 17 inches. Designed for networked environments, it includes the type of live emulation switching first seen in the QMS-PS 410, automatically switching among PostScript, HPPCL, HP-GL, and other optional emulations.

Built with a modular design, the PS 2000 comes with 4 megabytes of RAM on the motherboard that can be expanded up to 16 megabytes. You can add internal hard-disk drives of 40 or 120 megabytes, and an external SCSI port lets you daisy-chain up to six additional drives for even more storage. Other options include a 1,000-sheet feeder and a duplexer.

A year ago, this kind of power and speed would have cost you well over $20,000, but prices have dropped, and QMS' list price for the base model is a little less than $16,000.

QMS, Inc., One Magnum Pass, Mobile, AL 36618; (800) 523-2696. $15,995 (base configuration, pricing of options not set at press time).

QuickMail Keeps Pace

Following close on the heels of Microsoft's announcement of Mail 3.0, CE Software has announced QuickMail 2.5. Although it's not a complete rewrite, it does pack enough enhancements to make it worthwhile.

For mixed networks, QuickMail 2.5 offers several significant improvements. PC users running PC AppleTalk and the QuickMail Client software can now talk directly to the QuickMail Mac server. For users in environments running AFP-compatible PC network software, such as NetWare, Banyan, 3Com, and LAN Manager, no AppleTalk card is required. The PC QuickMail Client software can send messages to the PC file server that the Mac QuickMail server can retrieve for distribution to the Mac clients. The QuickMail server's polling is automatic, and the mail supervisor can set the polling frequency.

For Mac users — and especially their mail administrators — one of QuickMail 2.5's biggest enhancements is the change to a single-copy architecture. Now, instead of replicating the same message — and its enclosures — ten times for ten different recipients, the server stores only one copy of each and sends notifications to the recipients, which saves space on the server. Version 2.5 also boasts improved timing options and support for Apple's Com Toolbox.

QuickMail Remote users who've found a conventional terminal-emulation program more convenient than QuickMail Remote will be glad to know that Remote now has an interface that looks and functions just like that of regular QuickMail.

Finally, QuickMail users will see several small but important improvements. Forwarding messages is now much clearer than it was before (losing your job is less of a possibility, now that you can tell

where the message is really going), and address books can be accessed through a pop-up menu.

Although QuickMail 2.5 still doesn't include automatic directory updating, as does Microsoft Mail, CE has included a utility that the network administrator can configure and distribute so users can update their systems just by running the installer.

In the future, CE will introduce a Windows 3.0 client, and it is expected to use its newly acquired Perfect Timing technology to bring out a network-scheduling and personal-calendar system integrated with QuickMail.

CE Software, 1854 Fuller Road, P.O. Box 65580, West Des Moines, IA 50265; (515) 224-1995. Ten-user pack, $599.95; five-user pack, $399.95.

Sony Means Multimedia

Sony has been expected to step to the forefront of multimedia for some time, and it's finally taken the first step. The Sony Vbox is an inexpensive computer/video-interface box that lets you control several Sony consumer-level video products from a computer.

The key to the Vbox is Sony's ViSCA (Video System Control Architecture) protocols, a set of Sony-developed commands for synchronized control of multiple video peripherals, including 8mm VCRs and camcorders. Apple has endorsed the ViSCA standard and is developing a ViSCA device driver and tool kit that it will distribute to developers for free. Both Farallon Computing and MacroMind have already announced plans to support ViSCA in their upcoming multimedia products.

By daisy-chaining seven Vboxes, users can control and switch among as many as seven Sony video devices from a single serial port on the Mac. Control can even include zooming the camcorder in and out

QuickMail Remote users, rejoice! Among the improvements to QuickMail 2.5 is a QuickMail Remote that looks and acts like regular QuickMail.

The Vbox isn't as big as it appears here, but this inexpensive computer/video interface bodes well for Sony's future in multimedia.

from the Mac. By using an NTSC converter in conjunction with a Sony 8mm VCR, users can easily transfer presentations to tape and integrate live video into a presentation.

The Vbox doesn't bring frame-accurate video editing to the masses, but it does suggest that Sony may be the company to bring multimedia into everyday life.

Sony Corp. of America, Computer Peripheral Products Co., 655 River Oaks Parkway, San Jose, CA 95134; (408) 432-1444. $249.95.

Hard Disk Toolkit

A good hard-drive formatter is as essential a utility as a good data-recovery package. Until now, most users have had to struggle with Silverlining. Now there's an alternative. FWB's Hard Disk Toolkit equals or exceeds many of Silverlining's capabilities, but its interface is much easier to use.

Hard Disk Toolkit consists of five separate modules: a formatter, a microcode optimizer, a benchmarking utility, an INIT for removable media, and a diagnostic tool similar to SCSI Probe.

The package's formatter is the principal tool. A low-level SCSI formatter, Hard Disk Toolkit Formatter installs intelligent drivers that can optimize performance and, on Apple hard drives, actually increase storage capacity by 2 to 8 percent. The formatter also offers true partitioning, and you can resize partitions without destroying your data.

Although most of the other modules in the package will be of interest primarily to technicians or hard-disk junkies, they're all easy enough for most users to handle.

Although reformatting your hard drive isn't something you're likely to do on a regular basis, formatting removable media, such as SyQuest cartridges, is a common occurrence and a formatter that's easy to live with is a blessing.

FWB, 2040 Polk Street, San Francisco, CA 94109; (415) 474-8055. $199.95.

More Mice

Third-party mice and trackballs are suddenly popping up all over.

Mouse Systems' A3 Mouse is a three-button optical unit that is A/UX-compatible. The three buttons can be programmed, so macros can be assigned to the buttons and left-handed users can configure the mouse to suit.

EMAC's trackball, Silhouette, uses a sloped design so the user's hand and wrist are supported, with the ball itself held between the thumb and forefinger. Ergonomics are behind the unique design.

Spark International's Cordless Mouse and Trackball use an infrared signal instead of wires to get their messages through the ADB. For long-distance mousing, Spark says, the units can be used up to 15 feet from their receivers.

Mouse Systems Corp., 47505 Seabridge Drive, Fremont, CA 94538; (415) 656-1117. $169.95.

EMAC, 48431 Milmont Drive, Fremont, CA 94538; (415) 683-2222. $99.95.

Spark International, Inc., 1939 Waukegan Road, Suite 107, Glenview, IL 60025; (708) 998-6640. Mouse, $160; trackball, $170.

Many mice. Among the latest third-party offerings are Mouse Systems' A3 Mouse, a three-button A/UX-compatible unit; Spark International's Cordless Trackball (the company also offers the Cordless Mouse); and EMAC's Silhouette trackball.

NewsLine

Reports and Analysis

Pixar Spins Off Software Division

PT. RICHMOND, CA — As its second round of programs was being released, Pixar announced that it would spin off a separate company to handle its software products. Pixar will continue to develop the RenderMan technology, but the development and support of applications using that technology will be the new company's responsibility. Development of and support for Pixar's current Mac software will also be the responsibility of the new entity. Under current plans, Pixar will not retain a financial interest in the new firm, which was unnamed at press time.

Claris CEO to GO

SANTA CLARA, CA — Catching the industry by surprise, Claris president and CEO Bill Campbell announced that he is leaving Claris to join GO as its president and CEO. Campbell's decision came only six months after Apple announced plans to retain control of Claris, and many industry observers believe that Campbell's decision was based on his desire to lead an independent company, which Claris had been scheduled to become. Campbell's management team will run Claris until a successor is chosen.

Hayes Wins Patent Case

SAN FRANCISCO, CA — The price of modems may be going up. Hayes Microcomputer Products has won a key patent-infringement suit against three manufacturers — Everex Systems, Omnitel, and VenTel — and as many as 300 other companies may ultimately have to pay royalty fees to Hayes. A federal jury found that the three companies deliberately violated a 1985 Hayes patent for technology used to control a modem and awarded Hayes a combined fine of $3.5 million. The verdict of willful infringement means that the fine can be tripled, should U.S. District Judge Samuel Conti so rule. Everex was fined $1.61 million; Omnitel, $885,000; and VenTel, $1.01 million. An appeal is expected.

Mediagenic Sells Out

MENLO PARK, CA — Following a huge, $19.7 million loss in 1990, Mediagenic has agreed to give up management control of the company to a Los Angeles-based investment firm, BHK Technologies. BHK acquired 25 percent of Mediagenic's stock in December.

Ventura Publisher Macintosh Edition

At last Ventura Software brings its venerable long-document-publishing package from the PC to the Mac.

Ventura Publisher Macintosh Edition brings considerable muscle to the task of long-document publishing. But if you're an experienced Mac user, you'll have to make painful adjustments to the software's awkward, unconventional mode of operation. The program may be powerful, but its roots in the DOS world are evident: It doesn't look, feel, or drive like Mac software.

Bilingual Ventura

Ventura Publisher's chief strength is that it runs on Macs as well as on PCs. Consequently, it provides one of the best methods for exchanging DTP files in mixed Mac/PC publishing environments. If you don't need PC/Mac compatibility, your best choice for long and technical documentation may still be FrameMaker, Frame Technology's publishing package for Macintoshes and UNIX workstations (see review, November '90, page 54). FrameMaker makes good use of the familiar Mac interface while providing power and functionality equal to that of Ventura's package.

Ventura Publisher has been the long-document-publishing package of choice in the PC world for some time, running first under GEM/DOS and now under Windows. To its credit, Ventura Publisher Macintosh Edition brings exciting new features to the process of creating long and technical documents on the Mac. The Macintosh Edition supports an incredible variety of both PC and Mac word-processing and graphics file formats. It boasts an outstanding integrated Table Editor and a solid Equation Editor that resembles Microsoft Word's method of typesetting mathematical equations.

And like any long-document-publishing package worth its salt, the software features powerful tools for cross-referencing, variables, and TOC (table of contents) and index generation across multiple documents. Ventura Publisher also supplies

tools for creating and manipulating simple graphics and provides image-control features for halftones. Color support, however, is limited to spot color. You can anchor frames and rotate text and graphics, but Mac users will find the process awkward.
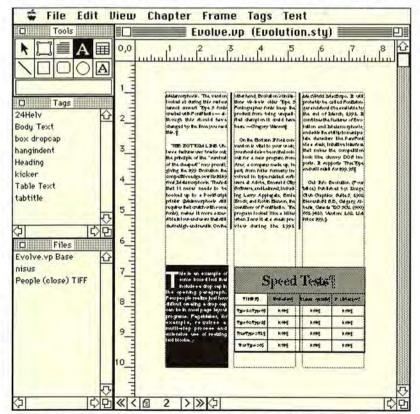
Installing Ventura Publisher requires a hard-disk drive with at least 4 megabytes of free space available. The program runs in 2 megabytes of RAM, but we found it unreliable with anything less than 3. Ventura Publisher loads all text into

memory when you open a document, so the more memory the better.

Like FrameMaker, Ventura Publisher uses a frame-based approach to page layout. When you launch the program, it opens to an untitled document (or chapter, in Ventura parlance). One annoying characteristic requires you to explicitly close any open file before you can open another — the program even dims the Open and New commands until the current file has been closed. PageMaker, another "serially monogamous" program, can at least close untitled files automatically when you open another file.

Font Management

The first time you use Ventura Publisher, the program scans your system and then creates and saves to disk a Font Width table containing character widths and kerning information for all your installed fonts. Most other Mac applications read this information from the screen fonts. Ventura Publisher reads it from the table it creates and uses the information to

Ventura Publisher Macintosh Edition brings long-document-publishing power from the PC to the Mac. The program will likely have the most appeal in mixed Mac and PC publishing environments, where Ventura Publisher versions for the PC running under Windows and GEM/DOS can exchange files with the new Mac version.
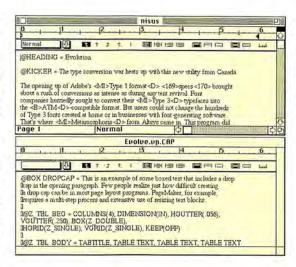
determine line breaks and character spacing. Although at first glance this approach may seem redundant, it actually has a benefit. If a file you're viewing contains fonts that are not installed in your system, Ventura Publisher selects similar substitutes from your installed fonts and determines the correct character spacing and line breaks by using the width table.

Ventura Publisher's unique approach to font management has some serious drawbacks, though. The program doesn't recognize more than 1,024 kerning pairs in any one font and may crash if it encounters more than that number. And because Ventura Publisher ignores kerning pairs beyond its limit as it builds the width table, it has kerning problems with many of the existing Adobe Originals, which have more than 1,024 kerning pairs. What's more, many more Adobe fonts with more kerning pairs than Ventura Publisher's limit are expected by the end of 1991. Although you can still use these fonts with Ventura Publisher, the elimination of some kerning pairs may have a marked impact on output quality.
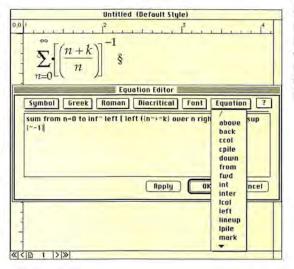
Creating chapters in Ventura Publisher involves several steps. The first will probably occur outside the program, because you will undoubtedly want to generate and edit your text with a separate word processor. That's because Ventura Publisher's editing powers are, to put it kindly, anemic. In all its incarnations, Ventura Publisher lacks even rudimentary search-and-replace capabilities — an astonishing shortcoming in a product designed for creating technical documentation.

Ventura Publisher's chapters don't actually contain the word-processing files you "import" and format. The program creates links, or pointers, to the external files. It then inserts its formatting codes into your original text. The codes become part of the text file, so if you have to go back and edit or spell-check the original file, you'll have an unpleasant surprise awaiting you. Even the text you create within Ventura Publisher, such as captions, is exported into external caption files, and all graphics are exported into external files too.

With this in mind, you might view Ventura Publisher as a very sophisticated front end to your word processor that provides preview, file-management, book-building, and cross-referencing features. In light of its DOS origins, this may make sense in the context of Word Perfect 5.1 and Microsoft Word for the PC, which

Ventura Publisher writes typesetting code back to the original word-processing files, making it difficult for you to edit or spell-check them later.

Ventura Publisher Macintosh Edition's Equation Editor works much like Microsoft Word's way of typesetting mathematical formulas.

until recently were decidedly non-WYSIWYG. However, its validity in the Mac environment is questionable.

Unruly Files

External text files are quite foreign to Mac DTP habits. Although some people may argue that it's better to have a myriad of smaller files than one giant, unwieldy typeset file such as that PageMaker creates, it's also quite apparent that a myriad of external files creates its own set of problems. For example, one 200-page manual we created in Ventura Publisher included a whopping total of 400 external graphic, text, and miscellaneous files. It's no wonder, then, that Ventura Publisher Macintosh Edition includes Manage Publication and Manage Files commands. You need them to tame your unruly herd of files.

Once your text is ready, you create a Ventura Publisher chapter by setting up page size, columns, and a style sheet that formats the text files. The style sheet contains tags that control the appearance of your paragraphs. Ventura Publisher offers considerable power over the printed word. Here its strength rivals and sometimes even surpasses that of QuarkXPress. Typographical features include automatic drop caps, automatic rules, automatic and manual pair kerning, tracking, and excellent command over vertical justification and spacing. Straddle elements in multicolumn formats are particularly well handled, and true running heads are possible (as they are in FrameMaker).

When you've placed your text on pages, you format paragraphs by selecting them with the tags tool and clicking on a tags name in the Tags window. Next, you can

select individual words within a paragraph and apply attributes such as italic or bold.

In addition to its dearth of Mac operating conventions, Ventura Publisher also exhibits some frustrating eccentricities. It has amazingly few keyboard shortcuts, and the menus are sparse. You have to select text before you can choose Bold, for example, which means you can't switch to bold, type a word in bold, and then revert to plain text. If you place the cursor at the beginning of a word that appears in bold or italics and then backspace, you don't delete a space; instead, you delete a hidden attribute code and the word loses its formatting. Even more exasperating, you can't undo this action. You have to use a special Copy and Paste command to ensure that you pick up the index or other special markers for selected text. Meanwhile, all these codes, although invisible in Ventura Publisher, are written back to the original word-processing files, where they form a kind of obstacle course for future editing.

The Bottom Line

For mixed environments that share files among Macs and PCs, you may want to add an additional mouse to the Ventura Publisher Macintosh Edition's three-mouse rating. But it's hard to imagine Ventura's package winning many converts among users who have cut their DTP teeth on the Mac. For them, FrameMaker presents a much more familiar face and offers long-document-publishing functionality on a par with Ventura Publisher's but in a far more stable package. And most definitely look elsewhere if you require graphics-intensive design. This is not Ventura Publisher's strength or promise.

— Gregory Wasson

[*A maintenance release, version 3.0.1, which will address some of the shortcomings of the first release of Ventura Publisher Macintosh Edition, should be available by the time you read this. Ventura Software claims that printing speed will be three to five times as fast as with the current version. WordBridge, a utility that lets you import Word 4.0 style sheets into* *Ventura Publisher Macintosh Edition, will be bundled with the product. In addition, version 3.0.1 will make the software compatible with the TOPS INIT, fix minor bugs, and improve on the documentation. A fix for the kerning-pairs problem is not planned for the immediate future. Ventura will send out version 3.0.1 free to all registered users. Add-on spelling and hyphenation dictionaries for 11 languages will be available. — Ed.*]

Get Info

Ventura Publisher Macintosh Edition
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Published by: Ventura Software, Inc., 15175 Innovation Drive, San Diego, CA 92128; (619) 673-6000.
Version: 3.0.
List Price: $795.

Multiplatform Publishing with Ventura Publisher

Ventura Software claims that it has the perfect DTP solution for mixed Mac and PC publishing environments. With Ventura publishing packages that run under the Mac OS, Windows, and GEM/DOS, it would appear that the company's claim is substantiated. A closer look, however, reveals several flaws in the Ventura multiplatform publishing solution.

Ventura's support for a wide variety of word-processing and graphics file formats is unequaled. Together, its publishing packages support 30 in all. But *MacUser* tests showed that although the files created in any of the three Ventura versions are indeed transportable to any other version, the transfer process is anything but seamless. Add to that slight inconsistencies in the interfaces of the three products, and you've got a less-than-perfect solution. One source of confusion is that some of the same tools in the Mac and Windows versions have different names — the tags tool (Mac) is christened the paragraph tool in the Windows package, for instance.

Although Ventura Publisher files opened easily in our tests of file transfers between the GEM/DOS and Windows versions, these same files occasionally presented problems when sent to the Mac. The problem was not so much opening PC Ventura Publisher files on the Mac as it was coaxing the files error-free into the Mac Ventura Publisher environment. Problems included clipped graphics, balking at PC Microsoft Word files, and changed hyphenation and line breaks in files generated by the GEM/DOS version.

In Ventura Publisher's favor, fonts never presented a problem in our file exchanges, because of the unique Font Width tables that accompany publications. We commend Ventura for engineering that lets Mac users open and view PC files that contain fonts not installed in their Mac system.

However, Mac-to-PC file transfers were more complicated, because the Windows and GEM versions of Ventura Publisher do not directly read the Macintosh Edition's files. You must first convert Mac word-processing and Ventura Publisher files to PC Ventura Publisher formats.

In short, although transferring PC Ventura Publisher files to the Mac and back was possible, the process can get time-consuming and complicated. We eventually found workarounds to every file-transfer problem we encountered, but the process is not as well engineered as FrameMaker's multiplatform (UNIX, NeXT, Mac) approach.

Ventura Publisher file transfers over networks are far easier than those involving floppies. But in all cases, Ventura Publisher's use of the Copy All command — which it requires in order to preserve links and pathnames between external graphics and text files and parent chapters — in place of the Mac Finder tremendously complicates the process.

Ventura Publisher Windows Edition files don't always transfer to the Macintosh Edition without errors.

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ColorStudio

Letraset's ColorStudio is a top-notch tool for high-end color-image processing.

For professional-level control over color and high-end output, not even Adobe Photoshop can top the new version of ColorStudio, an image-editing and painting package from Letraset. But be prepared to pay a price to exploit ColorStudio's talents fully. Although dollarwise the new $995 ColorStudio costs a whopping $1,000 less than the original version and costs only slightly more than the $895 Photoshop, Letraset's program is decidedly more complex and difficult to use than Adobe's package.

Industrial Strength

ColorStudio is an indispensable tool for users who work regularly with color images destined for high-end prepress systems such as Hell or Scitex. It's an industrial-strength package that requires a significant investment in hardware and memory. We recommend a Mac II-class machine with at least 8 megabytes of memory, a 32-bit display card, and a large-screen display.

You also need vast quantities of disk space to accommodate the virtual files that ColorStudio creates as you work. A good safety margin for virtual disk space is four times the size of the file you're editing (don't forget to allow for the original file and the saved-as modified version). ColorStudio's high-quality images create huge files — you can easily end up working in the 30-megabyte range. A SyQuest or Bernoulli drive comes in handy for storing large finished art files.

Users well versed in color theory will immediately appreciate the program's exceptional control over color balance. Once you've scanned an image directly into ColorStudio (Letraset supplies drivers for most popular scanners), you can correct shadows, midtones, and highlights in each color component of the image. When you're satisfied with the image, you can save your correction settings and apply them to future scans when you want an exact match between images.

ColorStudio's software-based monitor calibration lets you correct the way on-screen colors are displayed. You can choose to make settings permanent so that calibration operates systemwide for other applications as well. Modification of ColorStudio's Calibration file gives you just about the most accurate picture you can get without add-on hardware.

ABCs of Color
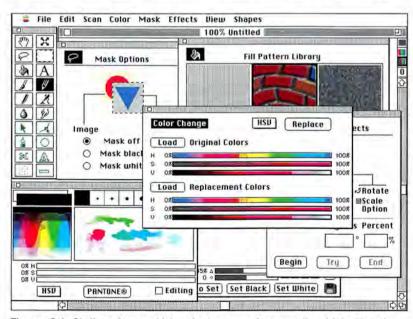
ColorStudio's handling of four-color separations is outstanding. After adjusting the RGB settings to an acceptable level, you can use the CMYK Color Correction dialog box to fine-tune the separations. You can save the CMYK adjustments you make and apply them to future work. You can preview all separations in color or black-and-white. Screen angles and frequencies are user-definable to four decimal places.

ColorStudio provides support for a large variety of proofing systems and film recorders. Letraset also plans to provide auto-correcting output filters for the DuPont 4Cast and Kodak XL 7700 dye-sublimation printers.

Although ColorStudio's tools may be more powerful than Adobe Photoshop's, they're not as easy to learn and use. Several steps are often required in ColorStudio to accomplish tasks that you can complete in one step with Photoshop — for example, converting a 24-bit-color file to 256 shades of gray is a simple menu choice in Photoshop, whereas ColorStudio requires a multistep, lengthy workaround.

The program provides a variety of powerful selection tools. The lasso operates in the standard fashion, as well as in Polygon, Oval, and Auto Selection mode. The Auto Selection mode lets you choose image areas on the basis of color, close hues, color range, and mask. You can refine all selections by additions and subtractions. Selected areas "float" over the main image so you can work on other areas or perform operations without losing the selection. Then when you're ready to drop the selected area onto the main image, ColorStudio lets you specify feathering values to facilitate anti-aliased, blended edges. You can save all selections as selection regions and then reselect them later, a function similar to Photoshop's Alpha Channel. ColorStudio's selection tools are powerful but complex — the kind that will appeal to professionals but that may frustrate casual users.

ColorStudio provides a powerful mask layer, which it stores as a separate gray-scale image. This approach gives you fine control over the brightness, color, and saturation of masked areas. The density of

The new ColorStudio packs more high-end color-processing power than Adobe Photoshop but is harder to learn to use. The package's plethora of floating palettes provides excellent, on-the-fly control of color-image editing. But the complexity of these and other ColorStudio tools is likely to frustrate casual users.

black in the mask layer controls the degree to which masked areas are affected or protected. You can make masks by painting directly in the mask layer or by copying a portion of the original image into that layer.

Custom Painting

As a true-color painting program, ColorStudio again outshines Photoshop with its superior color control. With ColorStudio, you can vary paint opacity on the fly and in 10-percent increments, using numeric keys. Color palettes based on RGB, HSV, and CMYK are easy to set up and store. The palettes are especially useful for work, such as textile design, that requires many variations based on a limited selection of colors.

You can customize the program's painting tools to your heart's content, and you can change tool shapes and functions quickly and easily, using the program's floating palettes. The palettes remain on-screen for instant modifications until you choose to close them. However, you'll need a large display if you want to accommodate all of ColorStudio's palettes, because they take up a hefty share of screen real estate. Once you've modified a tool, ColorStudio lets you name and save the custom settings for future use.

The art of filling objects and areas with color is well implemented. Graduated fills can range from straight ramps to circles to arcs. There is even a triangular gradation that ramps among three colors, something that's very difficult to accomplish in Photoshop. You can combine fill areas to form any variety of shapes and ramps.

New Shapes Annex

An optional add-in package for the latest version of ColorStudio gives you drawing as well as painting tools — something you don't get with Photoshop. The $295 Shapes Annex drawing program installs directly into ColorStudio and provides a draw layer over the program's paint layer. You use Bezier control points and handles to manipulate drawings, just as you do with FreeHand and Illustrator. You can also import EPS line art from other PostScript-based packages.

Once you've moved your drawings into their final position over the paint layer, ColorStudio renders them into the paint image as perfectly anti-aliased lines and fills. You can also create custom tools with the drawing package that you can use in the paint layer for blurring, painting,

ColorStudio's Impressionist 2 filter and smear and blur tools were used to create this custom painting. The file began life as a 16-gray scan. Color was added with the Colorize feature of ColorStudio's paintbrush.

and editing. ColorStudio supplies a variety of special effects, including scaling, stretching, slanting, and rotating. You can also use its filters to create effects. Unfortunately, you're on your own when it comes to figuring out how to use them, because there's not much in the way of documentation about them. Experimentation yields the best results.

ColorStudio is a Rosetta stone of file formats. It can read and write just about any format, including non-Mac formats such as Targa, Scitex, and Crosfield.

The Bottom Line

Although ColorStudio may be beyond the scope of most casual users, professionals will appreciate the power and precision of its tools, particularly for sophisticated color-image processing. Once they've gotten beyond the initial confusion arising from the software's complex interface, ColorStudio will open up new vistas to savvy users.

— Doug Barnard

Get Info

ColorStudio
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Published by: Letraset, Inc., 40 Eisenhower Drive, Paramus, NJ 07653; (800) 343-8973.
Version: 1.11.
List Price: $995.

LabVIEW 2

Eddy-award-winning LabVIEW 2 presents an elegant approach to scientific data analysis.

Most engineers, doctors, physicists, and chemists aren't programmers, yet many of them often need custom software. For these professionals, LabVIEW 2 is a boon, letting them create applications and software instruments quickly and easily in a clear, graphic environment.

Using LabVIEW 2 can actually be fun. It automates and integrates procedures for the acquisition, monitoring, analysis, and presentation of data as well as for the control of laboratory instruments. It interfaces to a variety of lab equipment and eliminates low-level programming of instruments. Not only is LabVIEW's code reusable but it's also easy to create a standard user interface for use with a variety of lab hardware. Version 2.1 adds some features and flexibility, fixes some minor bugs, and is a giant leap over version 1.0.

LabVIEW has put Macs into places where no Mac has gone before. NASA scientists use it to create high-temperature superconductors in zero-gravity environments during high-altitude, parabolic flights, and other people use it for medical research, factory-machine control, chemical-process control, and education. Third-party hardware developers are even using LabVIEW and Macs as front ends to robotic-control systems, gas chromatographs, and image processing.
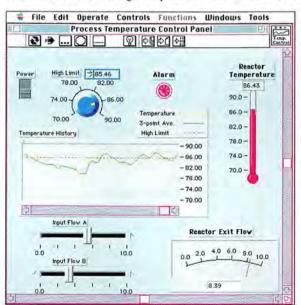
Virtual Programming

LabVIEW is based on the concept of the VI (virtual instrument), a software file that looks and acts like a real laboratory instrument on-screen. Each LabVIEW file is a VI comprising two parts: the front panel and the block diagram.

The front panel is the interface to the VI. It can contain realistic-looking (and -acting) control items such as knobs, buttons, slides, and switches as well as output items such as graphs and strip charts. You can even build in audible alarms to warn you if a reading goes above or below set limits. These objects are intelligent — that is, a switch knows how to look and behave; how to label itself; and most importantly, how to pass information to and from the block diagram.

Engineers accustomed to sketching out a block diagram before programming a data-acquisition task will feel right at home with LabVIEW. Only in this case, the block diagram *is* the program, with graphical objects representing programming elements. You choose the functions from the hundreds of objects available on the menus. Connecting them with the wiring tool gives you a block diagram — as well as a program.

The functions that block-diagram objects represent include such categories as digital-signal processing and filtering, numerical and statistical analysis, data input/output, and instrument control. However, the more complicated your VI, the more advanced your knowledge of LabVIEW needs to be. Some of the functions, such as those dealing with strings or arrays, are not obvious at first and will require some learning. Other objects act like little HyperCard stacks to take care of different cases or loops. I highly recommend going all the way through the lengthy tutorial. (National Instruments also offers a class for advanced users.)

One of the best things about LabVIEW is that you can use any VI as a part of another VI. This hierarchical aspect of the block diagram prevents you from reinventing the wheel and lets you use parts of VIs over again. For any VI you create, the Icon Editor lets you create a color or monochrome icon that appears in a menu as a subVI, for easy importing into other block diagrams. Double-clicking on a subVI icon in the block diagram brings up the block diagram for the subVI, which itself may contain other subVIs.

Your newly created subVIs aren't the only ones on the menus; LabVIEW comes with hundreds of VI files for you to use, copy sections from, or modify. The full installation, which comes on 14 floppy disks, consists of some 650 files occupying 19 megabytes of hard-disk space. (If you don't need absolutely everything under the sun, LabVIEW can get by with 3 megabytes of disk space.) The VIs that come with the program include drivers for 150 instruments (controls for IEEE-488 GPIB, RS-232/422, and VXI bus instruments) and analysis functions such as complex operations, curve fitting, matrix and vector algebra, and signal generation for simulations.

Facing the Interface

LabVIEW's interface is so elegant, so filled with innovative labor-saving devices that I wish National Instruments also sold drawing and page-layout software. For instance, LabVIEW has a Tool palette similar in size to the one in PageMaker. Tool palettes can be a pain if you frequently change between tools, but in LabVIEW, pressing the Tab key changes the cursor among the wiring, positioning,

LabVIEW lets nonprogramming professionals create virtual instruments quickly and easily. A typical LabVIEW front panel contains controls and indicators connected to lab instruments and measuring devices. To create the front panel, you select items from the Controls menu.

To create a LabVIEW block diagram, you use the wiring tool (highlighted on the Tool palette at right) to connect the programming objects. The Help window (upper right) identifies an object and its connection points. Some of the objects in this block diagram are subVIs, which are complete LabVIEW files incorporated into other files.

LabVIEW's Functions menu gives you a wide range of processes to choose from. On the last part of the hierarchical menu, the name of the selected icon is shown at the bottom.

operating, and labeling tools, so you don't have to waste time constantly dragging the cursor between your work and the palette.

LabVIEW also features smart pop-up menus. Just Command-click with the mouse cursor on any object in the front panel or block diagram, and the pop-up menu designed to modify that type of object appears. Both pull-down and pop-up menus expand into hierarchical menus and are well implemented. For instance, the Controls menu contains a field of icons, but the icon's name appears at the bottom of the menu when you highlight one of the icons. This naming convention is much easier to use than dealing with the vast field of icons you sometimes see in drawing programs. Users of older LabVIEW versions will be happy to learn that now almost any object (including wires) can be moved and resized.

The Front Panel window has an innovative feature that would be a boon to graphing programs. To set the numerical range of a graph or a control, just type in the upper and lower limits directly on the chart or control — the intermediate values are automatically calculated and displayed.

For running a VI, both the Front Panel and Block Diagram windows contain a button that runs through the VI once and another that runs it continuously. A big improvement over version 1.0 is that VIs are now compiled, which greatly improves their speed. New to version 2.1 is an option in the Save a Copy As command that lets you save a VI without the block diagram, so that users can't muck around with your design. There's a run-time version for those who don't want to supply each user with a $2,000 copy of LabVIEW.

Trouble-free Troubleshooting

When a VI isn't working properly, LabVIEW's built-in troubleshooting features can be great time-savers, particularly for very complex VIs that contain many levels of subVIs. For instance, if the wiring is illogical or there are open connections, the Run button will display a broken arrow. Clicking on it gives you a window telling you what's wrong, and another button finds and highlights the problem on the block diagram.

A light-bulb button (called Highlight Execution) highlights the path of logic through the diagram as you run the VI. You can open subVIs incorporated into your block diagram while one of the higher-level VIs is running. If the light bulb is on in the subVIs, you can watch the logic path in the subVIs as well.

If you think you may have connected some of the objects incorrectly, choose Show Help Window from the Windows menu. A Help windoid (a nonmodal window, in Apple's terminology) pops up, and it changes as you move the wiring tool over different objects in the block diagram. The Help windoid describes the various connection points of the object under the wiring tool.

LabVIEW adds a third button to the standard Save and Cancel buttons for saving changes when you close or quit. LabVIEW's Explain Changes button gives a detailed list of changes in plain English. This turns out to be a very handy feature with highly hierarchical file structures.

Of course, you may still be forced to resort to using the documentation, in which case you're in luck, because it is well written.

The Bottom Line

LabVIEW packs a rich data-gathering environment into a simple, elegant interface. It is also rock solid. I tested LabVIEW on a IIci, where it ran snappily, without a single crash or conflict. LabVIEW can continue monitoring and controlling in the background under MultiFinder.

LabVIEW is not cheap in price or memory. It requires 3.5 megabytes of RAM but runs on any Mac. To see if LabVIEW is right for your situation, I recommend getting the free demo package from National Instruments. The demo is a crippled, black-and-white version with a tutorial that gives you an idea of how it works (National was in the process of updating the demo at the time of this writing). If you can justify the cost, LabVIEW can save you a lot of time and effort.

— John Rizzo

Get Info

LabVIEW 2

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Published by: National Instruments, 6504 Bridge Point Parkway, Austin, TX 78730; (800) 433-3488 or (512) 794-0100.
Version: 2.1.
List Price: $1,995; run-time version, $495.

DacEasy Light Checkbook Accounting

DacEasy's simple, checkbook-based accounting package is worth a look.

Intuit's Quicken created and popularized the market for checkbook-driven, small-business accounting packages. Quicken proved that running a small business with a checkbook-based ledger system was easy to do and highly functional: Users didn't have to worry about cumbersome double-entry-bookkeeping accounting, sophisticated posting routines, or adjustments. All they had to do was write a check.

Light Checkbook Accounting, from DacEasy, typifies the genre. This straightforward, easy-to-use checkbook-driven general-accounting system can find a home in almost any small business or work as a personal-finance package.

The Details

Light Checkbook Accounting has nine menus: File, Edit, Bank, Card, Invoice, Accounting, Report, Misc, and Setup.

The various menu choices offer a logical way to enter the program but do require you to bounce around a little.

The Setup menu, which is the first menu you use, provides the setup screens for personalizing your copy of the program. You simply enter all the necessary name-and-address information as well as an optional password, forms choices, and other customization choices from this menu.

Light Checkbook Accounting comes with an easy-to-modify standard chart of accounts that can handle almost any business and can easily accommodate any slicing and dicing you might want to do for your personal finances. The program makes it easy to edit, add, or delete account information. Once you've established a balance in an account, Light Checkbook Accounting is smart enough to stop you from making any changes that

would affect the account data's integrity. However, sometimes this control becomes too restrictive, such as when starting balances need to be adjusted.

To write a check — the activity that triggers all Light Checkbook Accounting's actions — you use the Bank menu. The program can accommodate two types of checks: manual and computer-generated. The manual-entry facility is streamlined, so using it for record keeping does work. You should use the computer-generated option for multiple check writing or recurring disbursements.

Banking Business

Light Checkbook Accounting handles multiple bank accounts, which is a major feature for small-business users, sole proprietorships, or people with several bank accounts. When you tab to the Paid field, the program automatically brings up the Account Selection window, which lets you choose the account the payment will affect. If the right account is not already set up, the program lets you set it up on the fly. Multiple distributions can be accommodated easily, which makes Light Checkbook Accounting useful for compound payments or fairly sophisticated bookkeeping.
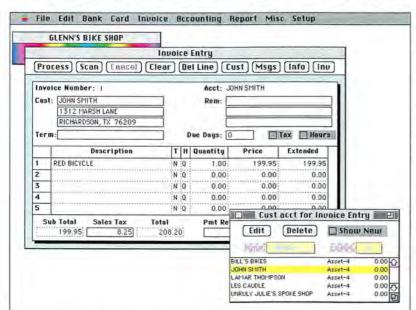
The program's Deposit/Withdrawal/Adjustment feature provides a straightforward, useful format for entering non-check-related banking activity. You can select multiple bank accounts, and the system keeps track of each entry with a separate transaction number that you can use later for reconciliations. Balances are dynamically updated and serve as a useful cross-referencing tool.

You can quickly view all of Light Checkbook Accounting's transactions in different ways. You can scan each transaction by using the Transaction window's Scan button, and after clicking on Scan, you can view your transactions on-screen. You can also select scans from the Misc menu.
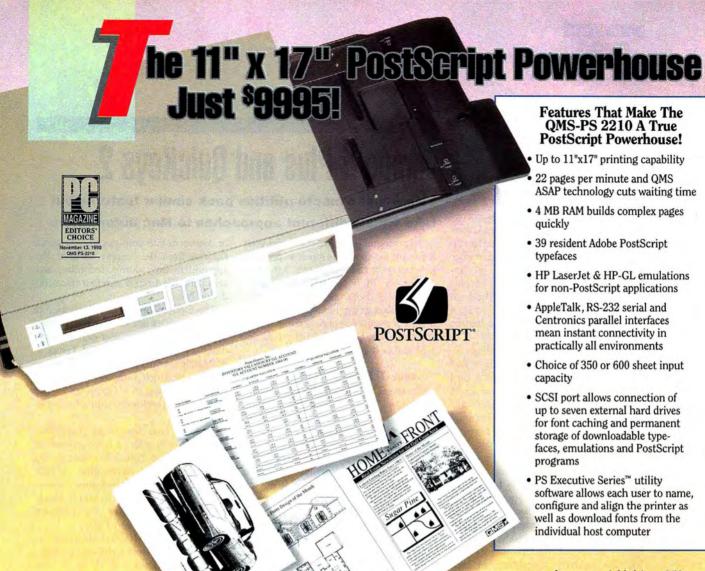
The Bank Register option activates the register screen, which is a virtual mirror image of a standard checkbook register. Transactions are again loaded for viewing, and the presentation is logical and clear.

Light Checkbook Accounting's unique feature is its accounting for credit-card purchases. The package keeps track of credit limits, credit available, current balance, and new charges.

You can distribute invoices to cash,

DacEasy Light Checkbook Accounting is a checkbook-based accounting package that would be at home in a small business or as a personal accounting system. Its invoicing is flexible enough that it could even be used as a point-of-sale system.

sales, or tax accounts. Invoice entry in Light Checkbook Accounting handles multiple-line invoices, automatic sales-tax calculations, days due, advance payments, and payment referencing, and you can print invoices in an attractive, professional format.

You enter all non-check-related or non-credit-card-related accounting transactions through the Accounting menu. The format is a standard debit/credit entry that does not automatically update batch-entry totals. The program can also easily accommodate memo transactions. Each batch of entries can reference a journal code, a transaction number, or a reference number as well as a description.

Other features include budgeting, recording comments with transactions, and a powerful option for bank and credit-card reconciliation. You can also use Light Checkbook Accounting as a POS (point of sale) system: The program automatically stuffs invoices into the Print Invoices window, which you can then print.

The program has a simple inventory system that is nothing more than an electronic scratch pad. It is helpful for small inventories, but it's not integrally linked into the program itself, so business users shouldn't rely on it. Finally, Light Checkbook Accounting produces a wide variety of accounting reports, including journals, activity statements, balance sheets, income statements, actual expenses, revenue/expense budgets, variance reports, directories, and even mailing labels.

The Bottom Line

DacEasy Light Checkbook Accounting is a well-done, functional small-business and personal accounting system. If you don't already own a checkbook-driven accounting system, this program is a solid contender for your dollars.

— Ken Landis

Tempo II Plus and QuicKeys 2

Two revised macro utilities pack similar features but take widely different approaches to Mac automation.

Two programs designed to keep your hands off the mouse as much as possible have recently been upgraded: Affinity's Tempo II Plus and CE Software's QuicKeys 2. Both packages make easy work of assigning mouse-issued commands or a sequence of commands to any keystroke, but QuicKeys' integrated design makes it easier to live with.

Tempo II Plus

Tempo II Plus looks like software by committee. To take full advantage of the program, you have to install three INITs, two Fkeys, one DA, and a stand-alone application. This is in addition to macro files and any special-purpose extensions you may need. An installer application takes the drudgery out of setting all this up, but the amount of clutter can easily be disconcerting.

Once you've installed all the program's files, macros are simple to create. As with Apple's MacroMaker, Tempo II Plus uses a recording-scenario interface. Choose Start Recording from the Tempo menu, perform the tasks you wish to include, stop recording, give the macro a name and a key equivalent, decide whether you want the macro to be available in all programs (a universal macro) or in just a particular application, and click on OK.

To incorporate opening an application or document into your macro, you select Options from the Tempo menu at the appropriate time during recording and select the file from a standard open-file dialog box.
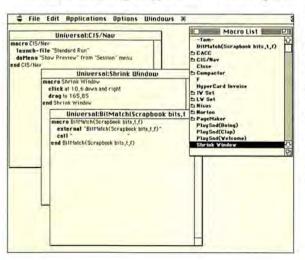
The Options menu item also lets you repeat a macro or branch to another macro, depending on certain user-defined conditions. This feature, along with Tempo's BitMatch external (explained below), is one area in which Tempo II Plus clearly has an advantage over QuicKeys — the ability to put conditional instructions into macros.

Another nice feature is Autopaste, which lets you select a large amount of text, a graphic, or both and create a macro key to place that information. A new enhancement also lets you direct sound recordings via the Resource Mover. Using any sound-input device, you can enter sounds directly into any file.

The new version lets you add macros to or remove them from a pull-down menu, using the package's Tempo+ Viewer application.

Tempo+ Externals is a collection of program patches that add functionality to macros. The new version adds 15 new externals to the 25 of the original package. Many of the 40 externals seem to address deficiencies in Tempo II Plus itself, such as checking to see if a program is running

Tempo II Plus is an expanded version of Affinity's powerful macro package. Tempo+ Viewer is a stand-alone application included in the package that lets you read (but not edit) macro scripts and lets you add macros to or remove them from the Tempo+ menu.

QuicKeys 2 beats Tempo II Plus in ease of use and overall design. Users can assign any number of commands — including several new extensions that come with QuicKeys 2.0 — to a single keystroke via QuicKeys' QuickPanel.

under MultiFinder. Others, such as the aforementioned BitMatch, are ingenious. Used in conjunction with Tempo's Bitmaps Fkey, this jewel looks for a certain image in a defined area of the screen. If it finds it, the macro will branch to another macro; if it doesn't, it will branch to a second macro. Two other powerful externals, Box and Button, let you create custom dialog boxes to launch one or more macros. Again, these conditional-instruction features make Tempo a very attractive program.

What makes Tempo II Plus unattractive is the Rube Goldberg collection of programs needed to make everything work. The disk's About file includes a list of full or partial application incompatibilities that reads like a who's who of Macdom: QuarkXPress, Radius monitor cdevs, PageMaker 3.0 (4.0 works fine), Full-Write, StuffIt, and many popular INITs and cdevs. It is also incompatible with Apple's DeskTop Manager. In addition, there is an incompatibility on the IIci with CE Software's CE Toolbox cdev (under the Finder only), which is required for such utilities as DiskTop 4.0 and Alarming Events.

QuicKeys 2

QuicKeys 1.2 was a rock-solid macro utility, but it had one glaring deficiency: Creating macros for a sequence of tasks was awkward at best. Happily, CE Software's QuicKeys 2 has eliminated that hassle. Unfortunately, the new product did not come out of the chute as rock solid as it used to be.

As with Tempo II Plus, you create sequence macros by using a recorder-type

interface that you access via the pop-out menu from CE's now ubiquitous CE Toolbox section on the DA menu, or you create them through a user-defined QuicKey. Also as with Tempo II Plus, you have the option of recording the macro on a sequence-by-sequence basis — recording only the specific action — or in real time — literally mirroring every cursor movement, drag, and click. Depending on the situation, one method may work better than the other, but the sequence method executes much more quickly.

As in previous versions, QuicKeys lets you create a macro for a single event through its QuickPanel window. These macros are classified as Alias (a new feature for assigning one keyboard character to another key), Buttons, Click, Date/Time, Extensions (new), File, FKEYs, Menu/DA, Mousies (line up, page down, and so on), Sequence, Specials, Text, and Real Time (new).

The QuicKeys package includes fewer extensions than does Tempo II Plus, partially because QuicKeys itself handles many of the tasks for which Tempo II Plus uses extensions. Some of the QuicKeys extensions include Grab Ease and Paste Ease (similar to Tempo's Autopaste), plus extensions to compress and decompress files using Aladdin Systems' StuffIt Deluxe, which is not included.

Once more, as with Tempo, you can assign QuicKeys macros to the QuicKeys pop-out menu in CE Toolbox. However, you can specify this action when creating or editing the macro without going to another program — a clear advantage over Tempo. Also, you can use QuicKeys' Timer option to execute a macro at a

predefined time, on startup, or when you launch an application.

QuicKeys has several other advantages over Tempo — for example, editing sequence macros is much easier with QuicKeys than it is with Tempo. Another advantage is the package's design: Everything is contained in two cdevs — the QuicKeys cdev itself and the CE Toolbox — plus the individual macro files and extensions. As a result, QuicKeys is much easier to use, and it "feels" cleaner. You can also extend the functionality of QuicKeys macros by linking them to other CE Software products, such as QuickMail and Tiles.

On the minus side, QuicKeys 2 was released with several infuriating bugs — unusual for a CE Software product. Most of the problems involved using the Installer, the Timer option, and general operation under the Finder. However, an update (version 2.0.1) was released within 30 days of the initial release. This version seems to have corrected the vast majority of the problems, although many users are still mentioning some more-obscure bugs.

The Bottom Line

Feature for feature, QuicKeys 2 is still the hands-down winner. Its integrated design makes it easier to install and use. The one advantage Tempo II Plus has over QuicKeys is conditional macros. If they're what you need, you'll have to go with Tempo II Plus and learn to live with its fragmented design.

— Tom Petaccia

A.M.E.

A.M.E. may be the most comprehensive — and potentially dangerous — security package ever.

You might not expect the maker of the game Crystal Quest to produce a serious security application. Casady & Greene's A.M.E. (Access Managed Environment) offers some of the most complete security options and features available for the Mac, but its unforgiving approach makes it suitable only for the brave at heart.

Lock Down

A.M.E. can function on any Mac from the Mac Plus on up and requires a hard-disk drive and System 6.0.2 or later. You must use the distribution floppy as a startup disk for installation.

Although A.M.E. makes modest demands in terms of hardware and memory, it does require some steady nerves and stable power during installation. The whole process takes from 15 to 30 minutes. The scary part is that any interruption, be it your cat walking across the keyboard or a power outage, will force you to reinitialize your hard-disk drive and restore your files and applications from backups. Don't install A.M.E. during a storm.

Installation places an INIT and a DA into your System Folder. The INIT seems amazingly compatible — one user I talked with uses A.M.E. with 45 other INITs on a regular basis and reported no problems with the system. I experienced no conflicts during testing.
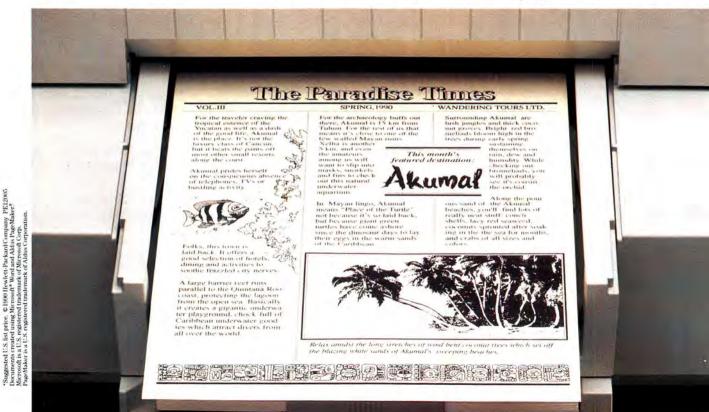
A.M.E. goes about its business in a variety of ways. It offers volume lock for your startup drive and any other SCSI hard drives you've protected during the initial setup, which means that no one can gain access to an A.M.E.-protected hard drive by booting the Mac with another System disk.

An A.M.E.-secured Mac forces you to sign on when you start the computer. Initially, someone assigned as the administrator defines access levels and privileges through the A.M.E. DA. You can limit access to programs, folders, disks, and files according to user level. You can even group a selection of files, programs, and so on into an access set — this makes it easy to assign common passwords and protection levels consistently. You can limit access in many ways: read/write, copy restrictions, floppy-drive use, and so on, and you can even restrict access to specific DAs or printers.

The degree to which you can customize all aspects of user access on a user-by-user level is impressive. A good example is A.M.E.'s treatment of passwords. You can configure the environment so that passwords are case-sensitive or are of a certain length. That much is standard. But you can also set an option that forces people to change their passwords at regular

With the HP DeskWriter, you can
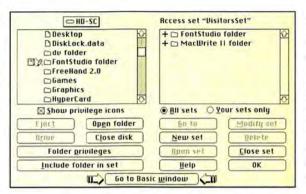
intervals. And you can set a control that locks out individuals trying to guess passwords, for increasingly longer periods of time.

A.M.E. can protect files as well as programs by requiring the use of passwords and/or key disks before a file can be opened or launched. You can also set encryption methods (fast or DES) to run automatically whenever you close a file or sign off as the current user.

Law and Order

System administrators can keep tabs on all aspects of a protected system by using A.M.E.'s outstanding Activities Log. The log permits the monitoring of peripheral usage, file and program launches, and virtually any other event that might occur. You can export the log to databases, word processors, and spreadsheets, providing an easy way for compiling statistics that might be used for billing or tax purposes.

A.M.E. also features a built-in INIT manager, auto-sign-off, and complete file erase. Various aspects of the program act

HD-SC	Access set "VisitorsSet"
Desktop	+ FontStudio folder
DiskLock.data	+ MacWrite II folder
du folder	
FontStudio folder	
FreeHand 2.0	
Games	
Graphics	
HyperCard	

☒ Show privilege icons   ◉ All sets   ○ Your sets only

Eject | Open folder | Go to | Modify set
Drive | Close disk | New set | Delete
Folder privileges | | Open set | Close set
Include folder in set | | Help | OK

Go to Basic window

as virus checks (and it comes bundled with Virus RX).

On-line context-sensitive help is always ready for perplexed users — a good thing, because the manual is rather shoddy. It's unattractively designed, poorly proofed, and all too often confusing — cardinal sins in a program that's this complex and powerful.

A.M.E. adopts a hard-line approach to desktop security and is often unforgiving of software that you might use on a regular

basis. You cannot use most disk optimizers on an A.M.E.-protected disk. And you cannot run installer programs that must be launched from a floppy. Specifically forbidden are Adobe Separator (you can request a special version of either A.M.E. or Separator to get around this prohibition), Disk Express II, INITPicker, Mac-Link Plus, TOPS 2.0, and a handful of others. If you have to use any of these programs, you must remove A.M.E. first, which takes as long as installing it.

A.M.E. is a complete — and possibly risky — security- and access-management package. You create user levels and assign privileges in a clear, graphical way. Its access sets provide an easy way to assign common passwords and access privileges to a group of files.

Which activities should be logged?

	Successful	Failed
Signing on and off	☒	☒
Use of printers	☒	☒
Use of DAs	☒	☒
Insertion of disks	☒	☒
Initialisation of disks	☒	☒
Use of serial ports	☒	☒
Opening of files	☒	☒
File reads	☒	☒
File writes	☒	☒
Launching of programs	☒	☒
Other file operations	☒	☒

Select users   ☒ Activities without users

Cancel   Help   OK

A.M.E.'s Activities Log provides detailed information about almost any activity on your Mac, so network administrators may find it useful for auditing computer usage.

The Bottom Line

A.M.E.'s feature set *is* impressive, but its numerous incompatibilities make it unacceptable for most people. And its potential for locking you out of your hard drive is so great that the first edition of the manual I received even warned that data loss is highly likely if an A.M.E.-protected drive is used by inexperienced users! That's refreshingly honest — but still scary. Although competing products such as ASD's FileGuard and Magna's Empower may not offer the same degree of security as A.M.E., they offer enough functionality to satisfy all but the most demanding computer environment. A.M.E. may have a role for users who need this degree of high-end security (or who have been ordered to use it), but everyone else will want to steer clear. It's a security product that makes you feel insecure.

— Gregory Wasson

It's no figment. It's pigments for

Org Plus for Macintosh

If organization charts keep your business running smoothly, you need Org Plus.

Org Plus, published by Banner Blue, is a software package that does one thing — create organization charts — and it does this well. Organization charts are those collections of boxes connected by lines, with the name and position of an employee in each box. They're used to provide a visual representation of the company's structure — who reports to whom.

Banner Blue is no stranger to organization-chart software — it publishes the number-1-selling organization-chart program for DOS computers, but don't let that turn you off. Org Plus for Macintosh is a Mac program through and through. Banner Blue did things right. Many of its

dialog boxes are nonmodal (yea!) and include an Apply button, Undo is available for most actions, and the context-sensitive help is excellent. And, of course, you can exchange files with the DOS version.
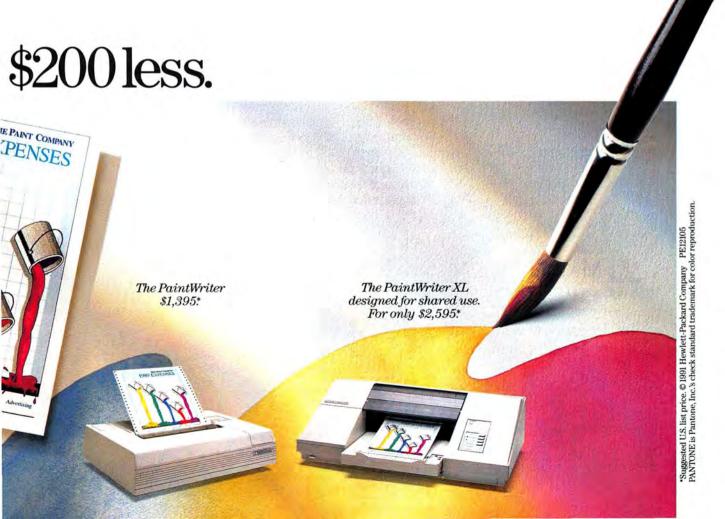
Before developing Org Plus, Banner Blue surveyed more than 2,000 organization-chart makers and discovered four important facts: The average organization chart contains 37 people, the average respondent maintains 16 charts of this size, the average chart is updated monthly, and respondents consider it their top priority to create compact charts that show as many positions as possible on a single page.

To be as useful as possible, a good organization-chart program should create and modify charts quickly and easily, offer flexible chart styles, automatically position and draw the boxes and connecting lines, resize boxes automatically, and make it easy to fit charts on one page. Banner Blue has created a program that does all these things simply and elegantly.
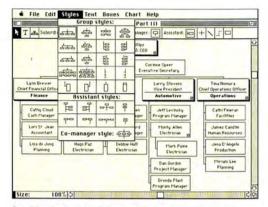
Building with Boxes

The basic building block of Org Plus is the box. The first thing thing you do when you start a chart is create a Label Setup, which defines what goes in each box — name, title, department, and so on. Don't worry if you don't get something right the first time, because you can change it later for the whole chart or selected boxes.

Once you've defined your Label Setup, your new page appears with a single box. All the boxes you create are subordinate to this topmost box, and you can create subordinate boxes to your heart's content. You can fill in the information as you create a box or create many boxes and type

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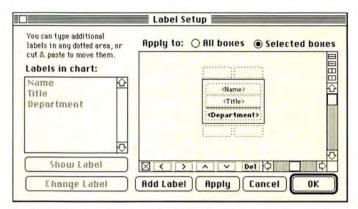
Org Plus is designed for creating organization charts. Making your organization chart reflect your company's actual organization is easy with the program's Styles menu.

Org Plus makes it easy to change what goes in all boxes, a group of boxes, or even a single box. This multifunction dialog box lets you adjust margins; select fonts; and add dividing lines, such as the one between Title and Department.

in the information later. Boxes expand to hold whatever you type.

To create your subordinate boxes, you simply click on the appropriate tool — Subordinate, Co-worker, Manager, or Assistant — and then click on the box to which you want your new box connected.

If you want to create several new boxes, just click on the tool the appropriate number of times. After you've clicked the box you want your new box or boxes connected to, Org Plus automatically draws the boxes and lines.

Once you've created your chart, you can spice it up by using Org Plus' drawing and text tools.

Re-Org

If you decide you want to change a box or group of boxes, just select them and use the Styles, Text, or Boxes menu to apply

You create new boxes in Org Plus by clicking on the tools — Subordinate, Co-worker, Manager, or Assistant — once for each box you want to create. Org Plus automatically draws the boxes and connecting lines.

new attributes. Before you print, you can use the Spacing command to adjust the horizontal or vertical distance between boxes. Then if you want the chart to fit on a specific number of pages, you select the Make Fit command before you print. This command is particularly smart — if the options you've selected won't reduce the chart enough to make it fit on the number of pages you've specified, you'll see a dialog box telling you the percentage by which you should reduce it in the Page Setup dialog box.

It sounds simple, and it is. The process is so intuitive, you could easily create your first chart without even looking at the manual. But you'd be missing a lot if you didn't at least give the manual a cursory glance. It's well written and includes an excellent tutorial you can complete in less than an hour, a complete and well-organized reference section, and lots of time-saving shortcuts.

The Bottom Line

Org Plus for Macintosh is a trouble-free, easy-to-use program that does what it's supposed to — create organization charts quickly and easily. When your organization changes, you can modify Org Plus charts just as easily.

The package comes with a 30-day, money-back guarantee and includes excellent context-sensitive on-line help. Technical support, which is free (but not toll-free) is prompt, and the staff obviously knows the product well.

If your job responsibilities include generating and maintaining organization charts, you'll definitely want a copy of Org Plus for Macintosh.

— Bob LeVitus

Get Info

Org Plus for Macintosh
♣♣♣♣½

Published by: Banner Blue, P.O. Box 7865, Fremont, CA 94537; (415) 794-6850.
Version: 1.0.
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Layout Templates	0	0	8
Ready-to-use Examples	8	7	16
4th DIMENSION Compatible	NO	NO	YES

Find 100 of 1,000 Records	:02	:03	:02
Sort 1,000 Records	:31	:32	:03
Delete 100 of 1,000 Records	:23	:25	:06
Import 1,000 Records	4:25	3:44	1:36

Benchmarks performed on a Macintosh Classic

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ACIUS

Publish It! Easy
♪♪♪♪½

For gourmet-style page design at blue-plate-special prices, nothing beats Timeworks' Publish It! Easy. Although you won't find high-end color-processing tools in this $249.95 package, Publish It! Easy combines word-processing, graphics, page-layout, and presentation capabilities in one package.

Publish It! Easy 2.01 shows improvement to an already solid product. Timeworks has made the program faster and easier to use by automating routine procedures, and it's even added tools for creating slide presentations. Improved color support and the elimination of some minor quirks completes the list of enhancements in the latest version.

Experienced users of Publish It! Easy are familiar with the program's library palette, which displays hierarchical menu choices (such as fonts, sizes, styles, and alignments) without making you hold down the mouse button. This lets you use the mouse to select text or objects or try out different choices on the library palette.

Version 2.01's library palette gives users the flexibility to change the number of linked text frames on a page. The text reflows automatically, so you can try several layouts before deciding which one to save. The library palette also contains commands that automatically create text boxes for headlines and subheads, control paragraph indents, and specify vertical justification.

Version 2.01 supports gray-scale TIFF files. Although color support is still limited to eight spot colors, you can now select colors from Apple's Color Picker. You can also assign different colors to individual characters or words in a text frame. Publish It! Easy 2.01 doesn't produce knockouts when you print spot-color separations, however, nor does it support process-color separations or Pantone matching.

To produce a slide presentation with Publish It! Easy, you create a publication in which each page corresponds to one slide. Excellent text and graphics handling, combined with built-in painting and drawing tools, make it simple to produce effective slide shows with standard DTP techniques. There are 49 special effects

that take you from one slide to the next.

Timeworks has eliminated some of the annoyances of previous versions. The custom tabs now work reliably, but they need more attention. Although tabbed text printed perfectly in my tests, it still looked out of alignment on-screen. Previous incompatibilities with SuperLaserSpool, SuperMac's popular print spooler, have been eliminated, and you can now add words to the spelling checker's dictionary.

If you don't need process-color separations, Pantone matching, or more than eight spot colors, look no further than Publish It! Easy 2.01.

Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015; (800) 535-9497 or (708) 948-9200. Version 2.01. $249.95.
— Darryl Lewis

Evolution
♪♪♪♪

Evolution, from Image Club Graphics, offers the best value for font conversion. Like the first Mac font converter on the market, Altsys' Metamorphosis, Evolution converts Type 1, Type 3, and EPS outlines from one format to another. And because Evolution never requires a PostScript printer, it's tailor-made for users who want high-quality type but can't afford a high-priced printer.

Using Evolution is simple. You select fonts installed in your System, choose the conversion format (Type 1, Type 3, or EPS outlines), and click on the Convert button.

Unlike Metamorphosis, which lets you generate several conversions at once, Evolution requires two passes to convert a font to both Type 1 and EPS outlines, because the software lets you select only one output format at a time. Evolution also does not produce AFM (Adobe Font Metrics) files, as does the Altsys software.

Evolution does provide sensitivity controls that help with complex fonts that may resist conversion with Metamorphosis. You can also specify a text string to be created with the EPS outline format, and you can output full or partial character sets as printer fonts.

Evolution converts Type 3 fonts produced by a variety of software, including Fontographer (except for version 1.0), Icarus M, and Bitstream. FontStudio compatibility was added recently to Evolution. An old Fontographer font was the only font that stymied Evolution — the

program refused to convert it.

You need at least a Macintosh Plus and System 6.0.4 or later to use Evolution. A hard-disk drive is recommended but isn't essential.

Watch for a new program, FontMonger, from Ares, a company whose staff has been long involved in type-related software. Some of these folks include Russ McCann (Adobe/Emerald City Software) and Larry Applegate, Ernie Brock, and Robin Henson (coauthors of FontStudio). FontMonger may be available by the time you read this. It combines the features of Evolution and Metamorphosis and lets you manipulate characters as ParaFont does. FontMonger's sleek, intuitive interface makes the other packages look like clumsy DOS imports. It supports TrueType and costs $99.95.

Image Club Graphics, Suite 5, 1902 Eleventh St. S.E., Calgary, Alberta, Canada T2G 3G2. (800) 661-9410. Version 1.02. $99.
— Gregory Wasson

MIDIplay
♪♪♪♪½

MIDIplay, from Opcode Systems, takes the kinks out of integrating MIDI sequences with Mac-based multimedia presentations. No more little black boxes with blinking lights, yards of cables, and jungles of mysterious connectors. MIDIplay is a HyperCard stack equipped with XCMDs that play standard MIDI files from within HyperCard, Silicon Beach's SuperCard, and MacroMind Director.

Although MIDIplay's main job is to export MIDI music files to buttons, stacks, or the Clipboard, it also lets you paste control buttons — including start, continue, and stop — and a MIDI setup button to stacks.

The program also includes goodies for manipulating sequences and tracks. A transposition function lets you change the pitch of individual or entire sequences. Initial volume settings can also be altered in each track. Tempo controls speed up or slow down sequences. Any changes you make, however, affect the entire track, which means that you can't transpose a trumpet part up one octave for the first three measures of a sequence and then transpose it back down one octave for the remainder of the piece, for example. Multiple changes such as these must be made with a sequencer program and then saved

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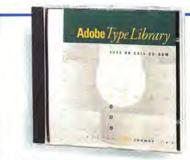
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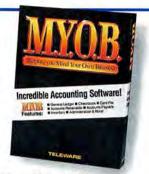
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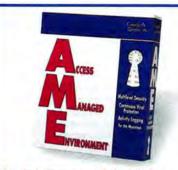
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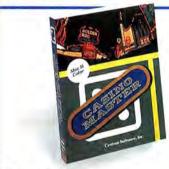
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Coda Music Systems
8188 MusicProse 2.0 . . . . 299.
5604 Finale 2.5 . . . . 549.
Davidson & Associates
1734 Math Blaster! 1.0 *(CP)* . . . . 29.
6128 Math Blaster Mystery *(CP)* . . . . 29.
8278 Alge-Blaster Plus . . . . 35.
EARTHQUEST
8050 EARTHQUEST 1.0 . . . . 48.
Electronic Arts
6716 Pipe Dreams 1.0 . . . . 17.
8643 Harpoon . . . . 39.
★ Great Wave ... 30 day MBG
KidsTime, Amer. Discov., KidsMath *ea.* 26.
4334 NumberMaze *(B&W)* 26. 8527 *(Color)* 36.
NumberMaze Decimals & Fractions
8043 *(B&W)* . . . . 26.   8044 *(Color)* . . . . 36.
2271 Concertware & MIDI . . . . 98.
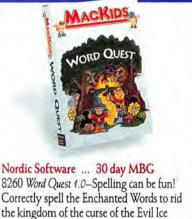
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Passport Designs

8250 *Encore 1.3.1*–Play, compose & print music. Supports tempo changes, industry standard MIDI files & real time transcription.... **$379.**
9442 *AudioTRAX*–Powerful MIDI sequencer with ability to record & playback 2 digital tracks. **129.**
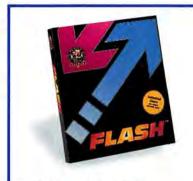
★HyperGlot Software ... 30 day MBG
Word Torture 4.0 - Beginner to Advanced *(Span., Fren., Germ., Ital. & Rus.)* ea. 35.
Pronunciation Tutor - Beginner *(Span., Fren.)* ea. 35. *(Germ., Chin.)* 39.
Verb Tutor - Intermediate *(Spanish, French, German)* ... ea. 39.
9349 Chinese Survival Manual .... 39.
9348 Chinese Writing Tutor .... 39.
6611 Kanjimaster - Beg. *(Japanese)* .... 99.
8026 Easy Kana .... 129.
Individual Software
7425 Training for Microsoft Word 4.0 .. 35.
4990 Training for Aldus PageMaker 4.0 .. 35.
★Inline Design ... 30 day MBG
5870 Bomber 1.3 *(includes headphones)* 32.
7622 Darwin's Dilemma 1.0............ 32.
8809 Tesserae 1.0 .... 32.

Nordic Software ... 30 day MBG
8260 *Word Quest 1.0*–Spelling can be fun! Correctly spell the Enchanted Words to rid the kingdom of the curse of the Evil Ice Witch. Words for grades 1-6 included. Requires HyperCard................ **$31.**

★Learning Company ... 30 day MBG
2670 Reader Rabbit 2.2 *(CP) (ages 4-7)*. $30.
5453 Talking Math Rabbit 2.0 *(ages 4-7)* . 30.
★Leister Productions ... 30 day MBG
7126 Reunion 2.0 .... 95.
★Microsoft ... 30 day MBG
2868 Flight Simulator 1.02 *(CP)* ...... 32.
★Mysterium Tremendum ... 30 day MBG
5841 Moriarity Revenge *(CP)*.......... 32.
★Nordic Software ... 30 day MBG
8258 Turbo Math Facts 1.1 .... 26.
8260 Word Quest 1.0................. 31.
8257 PreSchool Pack 1.0 .... 36.
Passport Designs
8253 TRAX 2.0 .... 59.
9442 AudioTRAX.................... 129.
8254 Desktop Music Creativity Kit ..... 189.
3117 Master Tracks PRO 4 4.1.4....... 319.
8250 Encore 1.3.1................. 379.
8880 Alchemy..................... 439.
★Penton Overseas ... 30 day MBG
VocabuLearn/ce Levels I & II *(French, Italian, Spanish, German, Russian, Hebrew, & Japanese)*. ea. 35.
★Personal Training Sys. ... 60 day MBG
We carry over 60 learning levels from beginner to advanced for Quark XPress, Excel, Persuasion, FileMaker II/Pro, PageMaker, Illustrator, FreeHand, Word, HyperCard, and the Mac ,..... ea. 52.
Postcraft
7601 Citadel & Citadel Secrets Hint Book. 31.
Premier Technology
Strategic Conquest or NetTrek . ea. 34.
Sierra On-Line
3397 Leisure Suit Larry *(CP)* .... 23.
Sir-Tech Software
8228 Wizardry II: Knight of Diamonds *(CP)* 29.
Software Toolworks
4619 Mavis Beacon Typing 1.3 *(CP)* .... 32.
4588 Life & Death *(CP)* .... 32.
★Spectrum Holobyte ... 30 day MBG
Tetris 1.1 or Welltris 1.1........ ea. 22.
8180 Faces...................... 24.
3459 Falcon 2.2 .... 32.
★Spinnaker ... 30 day MBG
2328 Sargon IV *(CP) (chess)* .... 28.
★Strategic Studies ... 30 day MBG
8084 Halls of Montezuma .... 26.
8085 Panzer Battles................. 26.
StudyWare
ACT, GMAT, GRE, or SAT Prep . ea. 29.
8098 LSAT Prep for the Mac .... 35.
★Terrace Software ... 30 day MBG
8192 Mum's The Word *(gardening)* ..... 79.
★Toyogo ... 30 day MBG
7836 Go Junior .... 19.
7624 Nemesis Go Master 4.7.......... 41.
7623 Nemesis Go Master Deluxe 4.7.... 85.
★Voyager ... 30 day MBG
Amanda Stories *(vol. 1, 2 or 3)* . ea. 18.
★XOR ... 30 day MBG
8061 MacSki 1.01 .... 39.
6040 MacGolf Classic 1.0 *(CP)* .... 52.

Beagle Bros. ... 30 day MBG
7691 *Flash 1.1*–Start flashing your co-workers today! The friendliest way to transfer files over AppleTalk–without a File Server. Transfer files from the Finder or within any application **$125.**

NETWORKS & COMMUNICATIONS

★Abaton ... 30 day MBG
6266 InterFax 24/96 Modem .... 349.
Applied Engineering
8365 DataLink Express .... 175.
DataLink/Mac or Mac Portable ea. 209.
8938 DataLink LC .... 265.
8362 QuadraLink .... 209.
★Beagle Bros. ... 30 day MBG
7691 Flash 1.1.................... 125.
★CE Software ... 60 day MBG
5173 QuickMail 2.2.3 *(10 user)*........ 315.
CompuServe
1676 Macintosh Membership Kit 1.03 ... 23.
1673 CompuServe Navigator 3.0 ...... 49.
1674 Membership Kit/Navigator Bundle . 68.

DataViz ... 60 day MBG
1823 *MacLink Plus/PC 5.0*–Transfer & translate documents between Mac & PC. Over 250 spreadsheet, word, database, & graphic translators. Both contain DOS Mounter software .. **$129.**
4842 *MacLink Plus/Translators 5.0 (Qty. 250)*. **109.**

280U

MacConnection
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DeltaPoint ... 60 day MBG
8967 *Taste 1.0*–A fast and easy-to-use word processor with page layout capability, a fully integrated draw layer, an internal address book with built-in mail merge, and full Macintosh color support. . . . . **$84.**

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4842	MacLink Plus/Translators 5.0.	109.
Dayna Communications		
8720	DaynaTALK *(5 Pak)*.	379.
8721	DaynaTALK *(10 Pak)*.	689.
8719	EtherPrint.	349.
★Dove Computer ... 60 day MBG		
6758	DoveFax Desktop 1.1.1	295.
★Dow Jones ... 30 day MBG		
5295	News/Retrieval Membership Package	24.
EveryWare		
8077	AllShare 1.0	139.
★Farallon Computing ... 30 day MBG		
5707	Timbuktu 3.1	95.
4866	Timbuktu/Remote 2.0	123.
6371	Timbuktu/Remote Access Pack . .	845.
8707	Liaison 3.0	259.
6273	PhoneNET StarConnector 10-Pack.	129.
4869	PhoneNET Connector 10-Pk *(DIN-8)*	198.
2206	PhoneNET StarController 300	825.
6687	PhoneNET StarController-EN	1589.
6766	MediaTracks	189.
6768	MediaTracks Multimedia Pack	319.
★Freesoft ... 60 day MBG		
6115	White Knight 11.	85.
★Global Village ... 30 day MBG		
8946	TelePort A300	129.
8945	TelePort/FAX	185.
Hayes		
2300	Smartcom II 3.2	84.
2307	Smartmodem 2400.	349.
5991	V9600 Baud Modem	689.
Insignia Solutions		
7557	Access PC 1.0	62.
7058	SoftPC-AT/EGA Module	125.
4089	SoftPC 1.3	245.
Intel Corporation		
5119	2400EX Modem	179.
6420	2400EX MNP Modem.	229.
8193	9600EX Modem *(w/QuickLink II)*. .	549.
International Business Software		
8581	DataClub *(3 user)* 199. 8580 *(10 user)* 539.	
★Kennect Tech. ... 30 day MBG		
5631	Rapport 1.3.4	195.
7588	Drive 360 *(5¹/4")*	249.
7590	Drive 1200 *(5¹/4")*	249.
5632	Drive 2.4 *(3¹/2")* *(incl. FastBack II)* .	325.

★Microcom ... 30 day MBG		
7459	CarbonCopy Mac *(Single)*	$117.
7465	CarbonCopy Mac *(Twin Pack)*	169.
8027	MacModem V.32	689.
★Microsoft ... 30 day MBG		
9444	Microsoft Mail 3.0 *(1-5 user)*	269.
★Nuvotech ... 60 day MBG		
3000	TurboNet ST *(DIN-8)*	30.
6751	TurboNet ST *(12-Pack)*.	279.
6272	NuvoLink SC	389.
★Orchid Technology ... 30 day MBG		
6949	OrchidFAX Modem 1.06	429.
★Practical Peripherals ... 30 day MBG		
3102	2400 Baud External Modem	179.
8994	2400 V.42 bis Modem.	209.
7934	PM9600SA Modem 1.26	489.
3089	Mac Communications Pack	225.
★Preferred Publishers ... 30 day MBG		
8943	DoubleTalk *(1 Pak)* 79. 8942 *(2 Pak)* 129.	
★Prometheus ... 30 day MBG		
8350	2400 Mini for Mac	149.
8348	24/96 Minifax	189.
8762	Travel Modem	189.
8349	Maxfax	289.
8709	2400M Plus.	219.
8738	9600M Plus	599.
8990	Ultima 9600	689.

ASD Software ... 30 day MBG
MaccessCard Reader combined with FileGuard 2.5 secures your Mac against unauthorized users.
7085 *FileGuard Extended 2.5.2 (1 user)* . . . . . **$139.**
9440 *MaccessCard Reader (reqs. FileGuard)* . . **299.**
9439 *MaccessCard/FileGuard (1) Bundle.* . . . . . **399.**

★Shiva ... 30 day MBG		
3444	NetSerial 3.3.	275.
4347	NetBridge.	409.
4942	TeleBridge	409.
3443	NetModem V2400 3.3	339.
6917	NetModem V.32 *(V.42 & V.42 bis)*.	1169.
6519	EtherGate	1619.
8189	FastPath IV	1889.
Sitka/TOPS		
4188	TOPS Teleconnector *(DIN8)*	23.
3720	TOPS Flashcard	155.
6264	TOPS Networking Bundle 3.0 . . .	187.
★Software Ventures ... 30 day MBG		
3455	MicroPhone II 3.0	215.
★Solutions, Inc. ... 60 day MBG		
6720	FAXGATE Plus 1.1.2	239.
★Synergy ... 30 day MBG		
6618	VersaTerm 4.5.	87.
6619	VersaTerm-PRO 3.5.	173.
★Traveling Software ... 60 day MBG		
3729	LapLink Mac III Connectivity Pac . .	93.
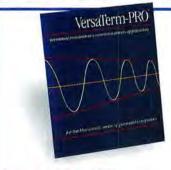
MECA ... 60 day MBG
2796 *Managing Your Money 4.0*–All new interface with version 4.0 makes Managing Your Money even easier! Comes complete with CheckFree electronic billpaying options as well as multiple small business features . . . . **$99.**

INPUT/OUTPUT

★Abaton ... 30 day MBG		
7432	Scan 300/GS *(reqs. Scan Kit)*	999.
	Includes free ProPoint ($79 value).	
American Power		
5895	UPS 110SE	209.
6686	UPS 370ci	339.
Caere		
8124	Typist	479.
4476	OmniPage 2.12.	495.
6660	OmniSpell 1.0.	69.
6658	OmniDraft 1.0.	69.
Chinon		
8814	DS-3000 Scanner w/Dig. Darkroom	699.
8815	DS-3000 Scanner w/OmniPage . .	1069.
Computer Friends		
8271	ColorSnap 32+	649.
★CoStar ... 30 day MBG		
6090	LabelWriter	179.
6067	LabelWriter Labels	9.
7452	LabelWriter Labels *(12-Pak)*.	49.
★Datadesk ... 30 day MBG		
6901	Switchboard *(modular keyboard)* .	159.

Synergy ... 30 day MBG
6619 *VersaTerm-PRO 3.5*–Communications program including Apple Communication Toolbox support & new protocol tools (TCP/IP, Telnet, FTP, LAT, ADSP, Serial Modem). Supports transfer for XModem, YModem, & Kermit protocols **$173.**

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Dear MacConnection,

As the President, Owner, Typist, and Janitor of Extraordinary Word Processing, let me thank you from the bottom of my heart. You have saved my life on a few occasions. My budget is a shoestring. I buy products as the need arises. I say I can do the job, order the software from you, and pray I can figure it out quickly. Recently, I got a call for a database job so I ordered one from MacConnection. The next morning, the doorbell rang. I assumed it was a customer, but it was my order! You promise a 24-hour turnaround, but if anything had gone wrong that day, I would have been doomed. Thanks, MacConnection, for letting me fly by the seat of my pants.

Kathleen Tauson

Kathleen Tauson
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Boston, MA

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Just for the record, all the ads in this series feature photographs of real live MacConnection customers and the real live letters they wrote us. Really!

We ship 'til 3:15 a.m.!

Total Systems ... 30 day MBG
Gemini Accelerator–A cost effective and quick solution for slow processing times. Installs easily in a Mac SE. With the optional Plus Kit, it can also be installed in Mac 128s, 512s, 512Es, and Pluses.................... **call**

SuperMac Tech.
7451	Dataframe XP 200 Hard Drive...	1399.
5451	Dataframe XP 330 Hard Drive...	2249.

★Total Systems ... 30 day MBG
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	68882 Math Coprocessors........	call

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7748	Personal LaserWriter Toner Cart....	89.
1115	LaserWriter II Toner Cartridge	105.

★Avery ... 60 day MBG
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4807	Laser Labels 1" x 2⅝" (Qty. 3000) .	24.
5392	Disk Labels 3½"-Laser (Qty. 630) ..	29.

★Basic Needs ... 60 day MBG
	Nylon Dust Covers..........	10. to 13.
7413	Mac IIcx/ci Monitor Stand	48.

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1723	ImageWriter II Cover.............	8.
1725	Mac SE Ext. Keyboard Cover set...	10.

★CoStar ... 30 day MBG
7453	The Organizer Jr.	82.
6091	The Organizer.................	199.

Innovative Data Design
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Curtis Manufacturing
8046	MVP Mouse	$89.

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8198	"What Do I Do Now" Book........	9.
2267	The Macintosh Bible (3rd Ed.).....	19.

★I/O Design ... 30 day MBG
8812	Ultimate Classic Carrying Case....	64.
6129	Ultimate SE/Ext. Carrying Case....	79.

★Kensington ... 30 day MBG
Full line available. Partial listing.
2559	Apple Security Kit..............	33.
9303	Keyboard Shelf	39.
6763	SE Radiation/Anti-Glare Filter ...	52.
2566	System Saver Mac (platinum)	63.
5064	Apple Color Monitor Polarizing Filter	63.
9301	PassProof....................	65.

★MacConnection ... 60 day MBG
4623	Solid Oak Disk Case (holds 90 disks)	32.
8795	Switch Box (2 Pos.) 32. 8796 (4 Pos.)	49.

★Mobius Technologies ... 60 day MBG
4470	Fanny Mac QT (Platinum)	55.

★Moustrak ... 60 day MBG
2694	Moustrak Pad (standard 7" x 9") ...	8.
2692	Moustrak Pad (large 9" x 11")......	9.
2693	Moustrak Pad L/F (large 9" x 11")..	10.

MacConnection ... 2 year warranty
SIMMs–Crank your system's memory to the max with our very own, very reliable 80ns SIMMs. Includes complete instruction booklet & installation video (VHS or 8mm). See line listing for specifics.

Ribbons
3255	ImageWriter II Ribbon Black	4.
9362	ImageWriter II Ribbon Black (12 Pack)	29.
3261	ImageWriter II Ribbon Multi-4-Color .	9.

★Sopris Softworks ... 60 day MBG
	Ripstame Nylon Dust Covers	call.
4014	High Trek Mac SE & Ext. Kybd. Case	69.

★Targus ... 60 day MBG
3617	Mac Plus/SE Carry Case.........	55.
4015	Mac SE & Ext. Kybd. Carry Case . .	69.

★Tripp Lite ... 30 day MBG
6200	Isobar 6 (surge suppressor, 6 outlets)	59.

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★Sony ... 60 day MBG
3297	3½" DS/DD Disks (10)	12.
6148	3½" DS/DD Disks 3 Pak (30)	29.
3298	3½" HD Disks 1.44 Meg (10)	19.
6375	3½" HD Disks 3 Pak (30)	49.
8185	QD2040 Tape Cartridge	19.

★MacConnection ... 60 day MBG
6592	44 Meg Removable Cartridge.....	75.

MegaGraphics
19" Rival Monochrome System for SE, SE/30 or II–*Macworld* Editors' Choice in large screens. Also includes coupon book with over $3000 in savings on special 3rd party products. **ea. $1199.**

★MAXELL ... 60 day MBG
2792	3½" DS/DD Disks (10)	13.
2793	3½" HD Disks 1.44 Meg (10)	21.

★3M ... 60 day MBG
3943	DC2000 40 Mb Data Cartridge	19.

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- We accept VISA and MASTERCARD.
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- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
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Continental US: Barring events beyond our control, all credit card orders phoned in weekdays by 3:15 AM EST will ship Airborne Express for delivery the next business day. Which means *same day* delivery for orders placed between midnight and 3:15 AM EST. (Some orders may ship by UPS Ground for next day delivery.) Saturday delivery available to many areas upon request. Some areas require an additional day delivery. The total freight charge on any order placed with MacConnection is only $3.
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is unsurpassed.

★**DayStar Digital ... 30 day MBG**
Listed items do not include coprocessor.

8556	FastCache for Mac IIci	$279.
8586	40 MHz PowerCache IIci	949.
8585	50 MHz PowerCache IIci	1689.
8583	SCSI PowerCard	1095.
	25 MHz PowerCard 030 *(II,IIx,IIcx)* ea.	1095.
	40 MHz PowerCard 030 *(II,IIx,IIcx)* ea.	1389.
	50 MHz PowerCard 030 *(II,IIx,IIcx)* ea.	1895.

GDT Softworks

6256	PrintLink Collection 4.0	59.
6151	JetLink Express 2.0	89.
8960	ParaLink Express	99.

Hewlett-Packard

6514	HP DeskWriter Printer	759.
6754	HP LaserJet III *(with toner)*	1699.
9355	HP LaserJet IIP *(with AppleTalk, 1 Meg & PostScript Cartridge)*	1799.

★**Kensington ... 30 day MBG**
Turbo Mouse 3.0 *(Plus or ADB)* ea. 107.

Kodak

6730	DICONIX M150 Plus Printer	399.

★**Kraft Systems ... 60 day MBG**

7519	KM30 ADB Joystick	42.

Logitech ... 30 day MBG
5082 ScanMan Model 32 Gray-Scale Scanner–
Scan in any type of image you need to enhance
your Macintosh document. 100-400 dpi with
ergonomic case and gray-scale editing
makes scanning a breeze............ **$299.**

★**Logitech ... 30 day MBG**

5082	ScanMan Model 32 G-Scale Scanner	299.

Magnavox

6690	14" Color Monitor with Micron Xceed for SE/30 *(640 x 480)* .... *special*	849.

MegaGraphics

	16" 8-bit System for SE/30 or II ea.	2595.
7841	16" 24-bit Color System for Mac II	4895.
	19" Rival Sys. SE, SE/30, or II . ea.	1199.
	19" 8-bit System for SE/30 or II ea.	4295.
7840	19" 24-bit Color System for Mac II	6395.
	19" G/S System for SE/30 or II ea.	1895.

★**Micron ... 30 day MBG**

7149	Xceed IIci-128 Cache Card	239.
6680	Xceed for SE/30 *(640 x 480)*	329.

★**MicroSpeed ... 30 day MBG**

6620	MacTRAC	62.
6621	MacTRAC ADB	75.

★**Mouse Systems ... 30 day MBG**

7560	Trackball ADB	69.
	Little Mouse or Little Mouse Plus . ea.	74.

★**Nutmeg Systems ... 30 day MBG**
15" Monitor: SE, SE/30, II or IIsi ea. 599.
19" Monitor: SE, SE/30, II or IIsi ea. 995.

Sophisticated Circuits ... 30 day MBG
*8009 PowerKey–*Turns your Mac & peripherals
on from the keyboard & off with "Shut Down."
Includes software for scheduling on/off & macro
events for unattended operation. Four filtered
outlets provide surge & overload protection **$65.**

19" Monitor: G-Scale SE/30, II, IIsi ea. 1295.
20" Color System: SE/30, II, IIsi ea. 2595.

★**Orange Micro ... 30 day MBG**

3036	Grappler 2.0 *(9 pin)*	87.
6229	Grappler LX	134.

Pacific Data Products

7412	Pacific Page PE 4.0 for the Mac	529.

Passport Designs

3115	MIDI Interface	85.

RasterOps

8526	Video Expander	529.
7469	ColorBoard 264 for SE/30	679.
7457	Video ColorBoard 364	975.
8944	RasterOps 24STV	1299.
	Business Color System: SE/30 or II	2995.

★**Sophisticated Circuits ... 30 day MBG**

8009	PowerKey 65. 8008 Wake-Up Cable	32.

TheComplete PC

6104	Half-Page Scanner/400	295.

Thunderware

4994	LightningScan 400	385.

★**Total Systems ... 30 day MBG**

8653	Galileo I Video Board *(for Mac SE)*	449.
9282	Galileo Video *(for Mac Plus)*	449.
8989	High Speed SCSI for Mercury 16+	189.

Nutmeg Systems ... 30 day MBG
19" Gray-Scale Display for SE/30, II or IIsi–
Delivers a flicker-free 72 dpi image at 78 MHz with 256
shades of gray. Includes video card, tilt/swivel
base and anti-glare screen. Please see line listings
for additional Nutmeg products... **ea. $1295.**

7817	16 MHz Mercury 030 *(for Mac SE)*	$389.
8624	16 MHz Mercury 030 *(for Mac Plus)*	519.
7816	20 MHz Gemini 030	799.
8708	25 MHz Gemini 030 w/o copro.	1179.
7814	33 MHz Gemini II 030	1375.
8371	40 MHz Gemini II 030	1499.

MEMORY & DRIVES

SIMMs ... 2 year warranty
Includes free instructional video tape.

1107	1 Meg SIMMs *(80ns)*	57.
8316	2 Meg SIMMs Set *(80ns)*	call
9437	2 Meg SIMM for IIsi & LC	call
7497	1 Meg SIMMs for IIfx *(set of 4)*	239.

Applied Engineering

8361	1.44 Meg High Density Drive	229.
8369	MacRam Portable with 1 Mb	399.
	MacRam Classic with 0, 1, or 3 Mb .	call

Cutting Edge ... 30 day MBG
*5456 45 Meg Removable Drive–*Offers the conven-
ience of removable media with the reliability of
Winchester technology. Features the popular
Syquest mechanism & includes a cartridge. **$599.**
5736 45 Meg Removable Cartridge .... **79.**

★**Cutting Edge ... 30 day MBG**

3989	800K External Disk Drive	149.
5133	20+ Meg Hard Drive	329.
3990	30+ Meg Hard Drive	389.
3991	45+ Meg Hard Drive	439.
5275	60+ Meg Hard Drive	489.
5276	80+ Meg Hard Drive	529.
5456	45 Meg Removable Drive	599.
5736	45 Meg Removable Cartridge	79.

Dayna Communications

8723	DaynaFILE 360k Drive	449.
8722	DaynaFILE 1.2 5¼" Drive	449.
8927	DaynaFILE 1.44 Mb	629.
8724	DaynaFILE Dual 360k & 1.44 Mb	739.

★**Dove Computer ... 60 day MBG**

	MaraThon 030 Upgrades ... ea.	529.
8186	MacSnap 524XE	199.
8187	MacSnap 524XS *(w/SCSI Port)*	249.
8649	MacSnap 596XE *(4 Mb)*	299.
8652	MacSnap 596XS *(4 Mb w/SCSI Port)*	365.

Peripheral Land, Inc. (PLI)

8335	PLI TurboFloppy 1.4	309.
8333	PLI Sony 40 Turbo Ext. Drive	499.
8327	PLI Infinity 40 Turbo	749.
8331	PLI 80 Meg Ext. Drive	739.
8330	PLI 105 Meg Ext. Drive	779.

Quantum
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separately as a MIDI file.

A generous help stack is provided to answer your questions. Although the layout of the stack is fairly straightforward and the contents comprehensive, a small manual or printable TeachText document explaining the basics would be welcome.

The use of HyperCard, MIDIplay, a MIDI interface, and a multitimbral-synthesizer module is a real boon to anyone interested in creating multimedia presentations. There are numerous advantages to using MIDI in this way, including the relatively small amount of storage space required for a MIDI file (versus a digital sound file); the ability to control external devices such as lights, film projectors, and musical instruments; and the availability of prerecorded MIDI files for those without the time or inspiration to compose their own melodies.

Multimedia takes on a whole new sound dimension with MIDIplay, an excellent tool that anyone in the MIDI realm can use to bring audio impact to their presentations.

Opcode Systems, 3641 Haven, Suite A, Menlo Park, CA 94025; (415) 369-8131. Version 1.0. $59.95.

— Christopher Breen

PlayMaker Football
♦♦♦♦½

If you're a fan of both football and computer games, you won't find a better combination of the two than PlayMaker Football. It's a superb game that's actually more coaching simulation than play simulation.

PlayMaker Football's monochrome aerial view shows a football field on which animated figures run offensive and defensive plays. The animation is reasonably good, and the game features authentic sounds. An announcer function calls up a dialog box that describes plays run by both teams. These announcements can be saved to disk as a game transcript.

PlayMaker Football works on several levels. At the most basic level, you can select two teams from the ones that come with the package. Generally, you control one team and let the computer control the other. Because the program includes simple AI routines, the computer knows what plays work and reacts accordingly. Beating the computer can be anything but a snap, and you're not restricted to simply watching the plays happen. One player (a quarterback, runner, or middle linebacker)

can be controlled by the mouse. As your skills improve, you can add new plays or refine existing ones.

The highest level of play involves building your own team. Each player's attributes can be set individually. You won't be able to create a team of super-players, however, because each team is limited to a certain number of points. Each level of skill and talent you select consumes points. You can build a good defense at the expense of your offense or emphasize the running game over the passing game, but you can't have it all.

After you've built a team, it's time to start building its playbook. It's not enough to be a good armchair coach in order to build a good playbook. You need to know how to run traps, draws, and screens if you expect to create good plays. The manual, two sample playbooks, and on-disk examples can help make you an expert.

Just as in real training camp, building plays means diagramming them on a chalkboard. You can tell each player where to move and what to do. You can set your quarterback, for example, to drop back, pump-fake, roll left, and toss to a halfback, who has faked a pass block and then broken out to the flat. After you save plays, it's best to take them to the practice field and refine them. Once the plays have been set, you use PlayMaker Football's AI features to specify when and how to use them. If you know, for example, that a certain team always runs on first down, be sure a run defense is always called. The AI features are especially crucial in league-type play, where the games are played without human involvement.

Because PlayMaker Football lets you have both teams use password-locked, user-specified playbooks to play, several electronic-football leagues have evolved. There are active leagues on CompuServe's MAUG area (GO MacFun, section 10) as well as on America OnLine.

The program is incompatible with the IIci and later Macs, but Brøderbund will supply a fix if you send in the master disk. The game is also heavily copy-protected, requiring you to insert a key disk each time you start up.

These minor annoyances aside, PlayMaker Football is simply the best football game you can get today on any microcomputer.

Brøderbund Software, 17 Paul Drive, San Rafael, CA 94903; (415) 492-3500. Version 1.0. $79.95.

— Steven Bobker

Stratego: The Computer Game
♦♦♦♦½

Accolade's Stratego: The Computer Game is not just another weak rendition of the best-selling board game. In fact, Accolade's version improves significantly on the original board game in several ways. For one, although the Stratego computer opponent may seem a bit predictable compared with the human variety, at least it's always ready and willing to play.

Just as in the classic Milton Bradley test of military cunning, Stratego's objective is simple — capture the enemy's flag before the enemy captures yours. Each side deploys an army of 32 officers (valued according to their rank), 1 spy, 6 bombs, and 1 flag. For quick setup, you can choose from a library of 13 preconfigured battlefield formations or create your own and save them to disk.
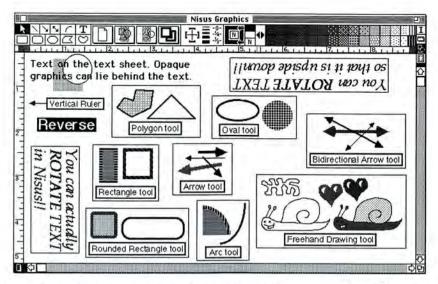
A typical game takes about ten minutes. You fight battles, defuse bombs, and try to protect your spy. Battles are sparked when two opposing pieces try to occupy the same square on the board. Victory goes to the higher-ranking piece, and ties end in mutual defeat. Because the enemy's strength is hidden until revealed in battle, caution and concentration are rewarded.

The computer opponent has five levels of ability, but even the highest level is somewhat predictable. Stratego more than compensates for this in rule variations. There's Silent Defense, in which only the attacker reveals rank. Playing under Aggressor Advantage rules, the attacker is always the winner in battles against equal-ranking defenders. And Rescue returns one captured piece to the field when a player reaches the enemy's back row.

Besides opponent predictability, Stratego's only other shortcoming is the copy-protection code wheel you must consult each time you launch the application. But these are minor drawbacks of a well-designed game. Stratego offers three different game boards and piece sets as well as impressive digitized sound effects and music. Well tailored to the Mac, it's MultiFinder-friendly and looks great in 8-bit color and monochrome modes.

Accolade, Inc., 550 S. Winchester Blvd., Suite 200, San Jose, CA 95128; (800) 245-7744 or (408) 985-1700. Version: 1.0. $49.95.

— Owen W. Linzmayer

If a picture is worth a thousand words, then why not use a word processor that processes pictures too?

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If you're new to the Macintosh word processing market, you probably want a word processor that is easy to use. If you've been around for a while, you undoubtedly want a powerful word processor. Chances are you have tried either MacWrite or Microsoft Word. 4.0. One is easy to use, the other offers power. Both, however, have severe limitations which is why we developed Nisus in the first place.

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CIRCUIT DIAGRAMS IN A NISUS® DOCUMENT

FIGURE 1A

SCIENTIFIC EQUATIONS WITHIN A NISUS® DOCUMENT

FIGURE 1

Nisus lets you draw attention to electronic symbols or scientific notation. Text wraps around your callout box automatically.

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Find and replace or index	■			
Find any font, *style*, size, or color	■			▨
Place text or graphic linked to parent text or graphic file	■			
Find and replace in unopened files	■			
Cross reference text	■			
125,000+ user definable key commands	■			
"Super Style sheets"	■			
Automatic File Comparison	■			
10 editable clipboards	■			
Mark text as electronic book mark	■			
Built-in Graphics	■			
Rotate text and graphics	■			
Unlimited undos back to "open file"	■		▨	
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PERSONAL BEST:

Two New Apple Printers

The conventional wisdom was clear: Apple made nice peripherals that cost too much. But Apple's newest high-quality, low-cost printers have just stood the conventional wisdom on its ear.

●

**BY
HENRY BORTMAN
AND
JON ZILBER**

Whot-o: Whhen Apple launched the Classic, LC, and IIsi last October, the buying public responded with a resounding cheer. Still, there was a note of quiet while hundreds of thousands of Macintosh users waited for the other shoe to drop: Budget-minded buyers were still looking for budget-conscious printers. The affordable but antiquated 72-dpi ImageWriter II was no match for the sleek new Mac Classic, and most laser printers still carried price tags well in excess of the costs of the new CPUs.

We're still waiting to hear the sound of one hand clapping, but we now know the sound of one shoe dropping: Whooossshhhh. Whirrrrrrrr. That's what you'll hear when you print from either of Apple's two new low-priced printers: the $599, 360-dpi thermal inkjet StyleWriter or the $1,299, 300-dpi Personal LaserWriter LS.

Although the two printers use radically different printing technologies, they have much in common: They're the first printers to ship with TrueType, Apple's new font strategy, which offers flexible, scalable, high-quality, and easy-to-use type. They're both first-time implementations (for Apple) of some impressive new technologies. They're both quiet, nicely designed, and simple to operate. And they're both priced aggressively to compete with popular third-party printers from companies such as Hewlett-Packard and GCC.

New Apple Printers

Figure 1: The many faces of Apple's StyleWriter. Left to right: the printer solo, for minimum footprint; with the bundled docking sheet feeder; and with the sheet feeder's output tray extended.

Wait a minute! Did someone say TrueType? Isn't that part of the long-awaited System 7.0? Yes, but it's now available as an INIT for System 6.0.7 as well (see the "Truth About TrueType" sidebar).

The Elements of StyleWriter

The StyleWriter is unlike any other Apple printer you've ever seen, technologically and designwise. For starters, it sits vertically instead of horizontally, meaning that it takes up very little desk space. It's also what adults and marketing types call modular but what kids of all ages know as a transformer: Various pieces snap on and swing out, depending on what you need (see Figure 1).

The basic printing unit — about the size of a tissue box turned on its side — can be used by itself for maximum transportability, although its nonfolding base makes it impossible to fit into a standard briefcase. An attachable sheet feeder adds convenience if you're going to do any

Figure 2: Printer Performance

BETA !

Better   Worse

Apple ImageWriter II	**Impact**
Apple StyleWriter	
HP DeskWriter	**Inkjet**
Personal LaserWriter LS	
GCC PLP II	
QMS-PS 410 (PostScript)	**Laser**

Word — Excel — MacDraw

Time in minutes
0   5   10   15   20   25
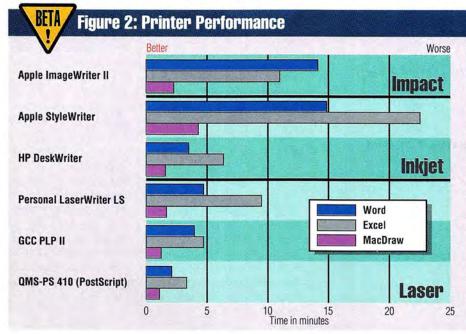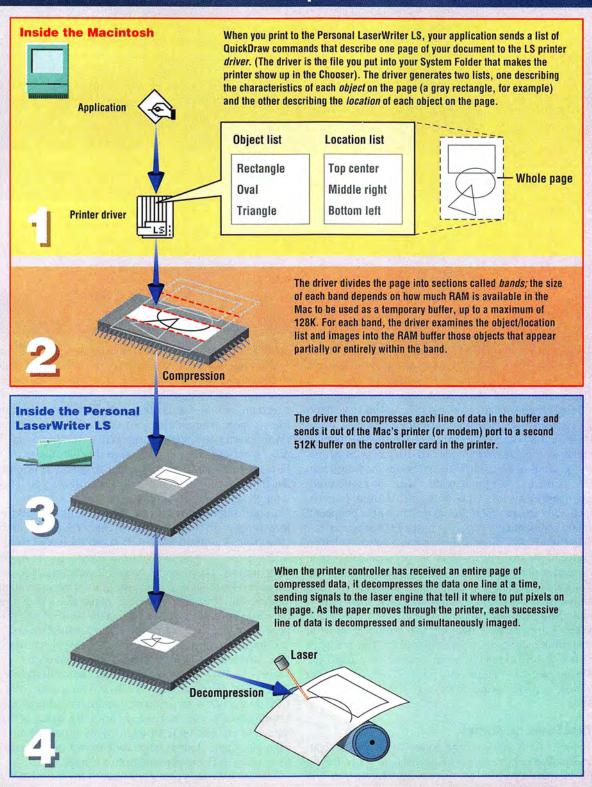
Figure 2: Because Apple's new printers are targeted at budget-minded buyers, MacUser Labs chose to test them on a Mac Classic. Because Classic owners are unlikely to use the sophisticated drawing and page-layout applications we use in our standard printer tests, we developed custom tests. We created three simple bread-and-butter test documents: a five-page Word document containing four fonts, a two-page Excel spreadsheet containing four fonts, and a simple MacDraw II drawing containing only a few words of text. All the tests used TrueType fonts only.

How It Works: Personal LaserWriter LS Compression

Inside the Macintosh

Application

1 **Printer driver**

When you print to the Personal LaserWriter LS, your application sends a list of QuickDraw commands that describe one page of your document to the LS printer *driver*. (The driver is the file you put into your System Folder that makes the printer show up in the Chooser). The driver generates two lists, one describing the characteristics of each *object* on the page (a gray rectangle, for example) and the other describing the *location* of each object on the page.

Object list	Location list
Rectangle	Top center
Oval	Middle right
Triangle	Bottom left

— Whole page

2 **Compression**

The driver divides the page into sections called *bands;* the size of each band depends on how much RAM is available in the Mac to be used as a temporary buffer, up to a maximum of 128K. For each band, the driver examines the object/location list and images into the RAM buffer those objects that appear partially or entirely within the band.

Inside the Personal LaserWriter LS

3

The driver then compresses each line of data in the buffer and sends it out of the Mac's printer (or modem) port to a second 512K buffer on the controller card in the printer.

4 **Decompression**

Laser

When the printer controller has received an entire page of compressed data, it decompresses the data one line at a time, sending signals to the laser engine that tell it where to put pixels on the page. As the paper moves through the printer, each successive line of data is decompressed and simultaneously imaged.

New Apple Printers

Table 1: Three Ways to Print

	👍 **Pros**	👎 **Cons**	👌 **Ideal Users**
Dot-matrix printer	• About $400 (street price). • Wide-carriage printing. • Networkable (ImageWriter). • Can use color ribbon. • Can print multipart forms. • Can use fanfold paper.	• Usually low-resolution. • Noisy. • Slow.	• Dot-matrix printers will likely be limited to people with very low-end Macs who can't afford the slow print times of Apple's StyleWriter or the slightly higher cost of HP's DeskWriter. Also, people who need to print multipart forms or want inexpensive, low-quality color printing will need dot-matrix printers.
Inkjet printer	• Less than $700 (street price). • Quiet. • Often 300 dpi or better.	• Print may smudge. • Very slow (StyleWriter). • No color.	• Inkjet printers are ideal for anyone who wants superior resolution but doesn't want to pay a premium.
Laser printer	• Fastest. • Networkable. • 300 dpi or better. • Nonsmudgeable output. • May include PostScript. • Many models to choose from. • Quiet. • Upgrade and expansion options.	• Most expensive. • No inexpensive color. • Expensive consumables.	• Laser printers may someday become the printers of choice for nearly everyone. The stumbling block continues to be their higher price. For high-volume business use or for desktop publishing, a laser printer is clearly the best choice.

kind of heavy-duty printing. There's also a paper-output tray that swings out of the sheet feeder. Ink cartridges cost $22.99 apiece and should last for about 500 pages.

The printing mechanism, manufactured by Canon, is a modified version of that company's thermal inkjet technology. The Canon BJ-10e Bubble Jet Printer, designed for use with PCs, has been on the market for several months. Similar to the StyleWriter, the BJ-10e costs $100 less ($499), but its optional sheet feeder brings the list price to $589. To use Canon's printer with a Mac, you need a third-party interface such as GDT Software's JetLink Express, which adds an extra $249. (Imagine: an Apple peripheral product competitively priced against a PC peripheral!)

The StyleWriter's output quality is top-notch. Although its price might imply ImageWriter-like output (144 dpi in Best mode), the StyleWriter's resolution has been cranked up to 360 dpi, higher than that of most laser printers. Text documents generally look similar to their laser-printed counterparts. (In our benchmark tests, we occasionally spotted a stray pixel or two, but you often see these on output from plain-paper laser printers too.) The quality of text is aided by the inclusion of Apple's new TrueType software (see the "Truth About TrueType" sidebar). In addition, graphics output is far superior to ImageWriter output.

Here Comes the Smudge

If you're thinking there's got to be a catch, you're right. The StyleWriter has a couple of Achilles' heels to go along with its innovative design, razor-sharp output, and low

price. For starters, the thermal inkjet technology it uses has a drawback: The ink smears if you get it wet. Even a moist fingertip is enough to streak the ink, although the output generally remains legible.

A more serious shortcoming of the StyleWriter for most users is speed. You get what you pay for: This ImageWriter-priced printer also boasts ImageWriter printing times. In other words: It's *slow*. If you've never known the speed of laser printing, you'll find it adequate for light-duty printing. But if you're used to printing pages per minute, you'll find it tough to go back to minutes per page.

In our benchmark tests (see Figure 2), the StyleWriter took roughly 15 minutes to churn out a relatively simple (five-page, four-font) Microsoft Word document from a Mac Classic — about seven times as long as most low-end laser printers. That may be acceptable for term papers and correspondence, but it's too slow for most business applications. And if you think that that sounds like a long time, be warned that the StyleWriter ground away on our two-page, four-font Excel-spreadsheet test file for 23 minutes.

Compared with a laser printer, the StyleWriter crawls. In fact, when tested with a Classic, the StyleWriter was soundly beaten by the *ImageWriter* on two out of three test documents. Because with the StyleWriter, your Mac's CPU does all the work of imaging a page (the printer has no "intelligence"), you will see significantly better performance when printing from significantly faster Macs. For example, Apple claims that printing from a IIci is roughly three times as fast as printing from a Classic.

The StyleWriter's poor performance is exacerbated by

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INTERNAL	$237	$267	$357	$407	$467	$887				*(Q) denotes Quantum Drive **Price Includes One Cartridge	

Figure 3: Apple's New Printer-Pricing Profile
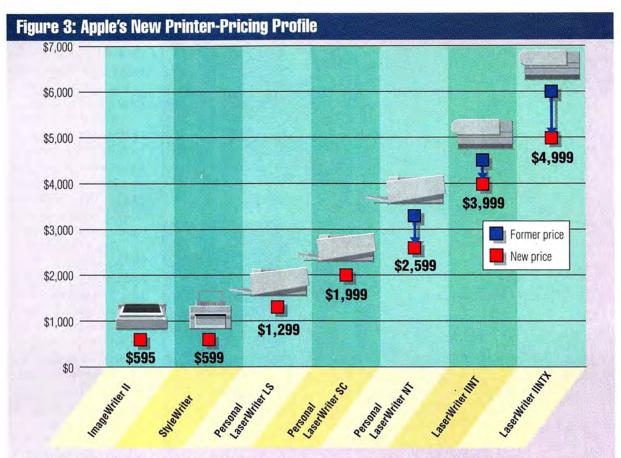
Figure 3: The low prices of Apple's new printers are complemented by reduced pricing on the company's three most expensive models.

the fact that Apple's PrintMonitor spooler, which comes as part of the Mac's system software, doesn't work with the StyleWriter (although Fifth Generation's $99 SuperSpool does). That's the bad news. The good news is that Apple plans to correct this problem, perhaps by the time you read this.

The StyleWriter may be slow, but Apple *has* managed to improve output quality over that of the ImageWriter, with a sixfold increase in the number of pixels on a page, while holding the line on price. At $599, the StyleWriter costs only four bucks more than an ImageWriter II. And given that Apple has no plans to lower the cost of the ImageWriter, there are really only a few reasons to even consider buying one these days: (1) You need a wide carriage for oversized documents; (2) you need color output, which you can get with the ImageWriter's multicolored-ribbon option; (3) you need an impact printer that works with multipart forms; or (4) you need the AppleTalk-network capability of the ImageWriter but can't afford a networkable laser printer (the StyleWriter can't be networked).

If you add a PostScript-emulation program such as Freedom of Press Light to the StyleWriter, you'll suddenly have high resolution and PostScript compatibility available for about $700 or less (depending on street-price discounts). Although the StyleWriter's slow output speed makes this option unsuitable for high-volume applications, it might make sense for anyone on a tight budget, students, or businesses that do only light-duty printing.
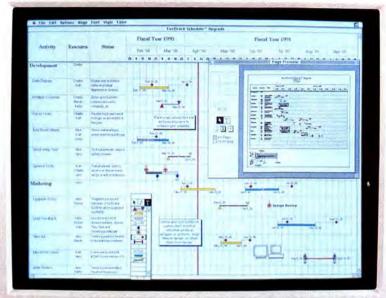
Low-Cost Laser Printing

Apple's other new printer is the Personal LaserWriter LS (see Figure 4). On the outside, it looks just like the previous low-priced laser champ from Apple, the Personal LaserWriter SC. It has the same Canon four-page-per-minute LBP-LX engine. The only immediately obvious new component is the price tag: $1,299. That's $700 less than the cost of the SC.

How'd Apple do it? Early LaserWriters contained nearly all the circuitry of a fully functioning Macintosh. To push prices down, the Personal LaserWriter LS forgoes much of that firmware. In its place, Apple has implemented a proprietary compression scheme that significantly reduces the time it takes your Mac to send a page to the printer. Although the printer controller contains only 512K of

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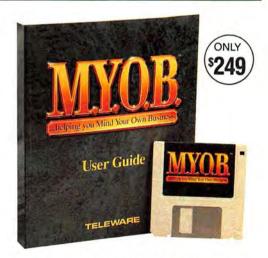
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New Apple Printers

The Truth About TrueType

No doubt you've heard about TrueType, Apple's new outline-font technology. Apple has been promising it for more than a year, as a major feature of System 7.0. With the introduction of the StyleWriter and the Personal LaserWriter LS, Apple has decided to unbundle it. These printers ship with a TrueType INIT that works with System 6.0.7 or later.

TrueType can do for you much what ATM (Adobe Type Manager) does: put better-looking type onto your screen and let you print high-quality type without using a PostScript printer.

The TrueType installation disk contains new TrueType-compatible drivers for all Apple printers and a new Font/DA Mover. Also included is a basic set of the fonts that come with Mac system software — Times, Helvetica, Courier, and Symbol — in TrueType format. By the time you read this, other printer vendors should be shipping

TrueType-ready drivers for their printers and third-party font vendors should be shipping additional fonts. Many drivers, such as HP's DeskWriter driver, already work with TrueType. One caveat, though: Because TrueType requires System 6.0.7, you'll have to upgrade if you haven't already done so.

Fortunately for those of us who are neither in the market for a new printer nor among those who plan to camp out at ComputerLand waiting for System 7.0 to arrive, Apple will make TrueType available to all System 6.0.7 users, free of charge. (Yes, we said "Apple" and "free of charge" in the same sentence.)

Don't get the misimpression that all TrueType *fonts* will be free, however. If you want to build your font library beyond the basics, you'll have to buy TrueType fonts, just as today you must buy PostScript fonts. Most major type vendors, including

Bitstream, Monotype, and LinoType, will offer their libraries in TrueType format at prices comparable with those of Type 1 PostScript fonts. As an alternative to boxing a new library of TrueType fonts, several companies have announced Type-1-to-TrueType conversion utilities, including Ares Software with FontMonger and Altsys with Metamorphosis Professional. However, whether these converted fonts retain the quality of the fonts in their original formats remains to be seen.

Perhaps you're wondering which one's better, TrueType or PostScript. So did we. To judge the quality of PostScript versus TrueType fonts, MacUser Labs did a preliminary comparison of the two technologies on a variety of popular printers, including Apple's two new offerings. Table B contains the results. Unless you're a font fanatic, you'll probably be hard-pressed to distinguish between the two. One thing is

Table A: Good-Looking Type Without a PostScript Printer

SCREEN	Macintosh Bit-Mapped Screen Fonts	PRINTER
Bit-mapped fonts are tuned for the Mac screen's 72-dpi display. Each dot of each character is individually placed for maximum screen-display quality. The drawback is that for bit-mapped fonts to look good on-screen, you must install a separate bit-mapped font for each point size of each typeface you want to use. Very large and very small type looks jagged and distorted. Apple typically ships 9-, 10-, 12-, 14-, 18-, and 24-point bit maps for fonts included with Mac system software.		To avoid jaggies when using bit-mapped fonts to print to a non-PostScript printer, you must install a separate bit-mapped font for each size you want to print. The bit map required to *print* type at a specific point size is a *multiple* of the size required for *screen display*, however, and the specific multiple depends on the resolution of the printer. For example, to display clean 12-point type on the Mac's 72-dpi screen, you need a 12-point bit map. But if you want to use bit maps to print clean 12-point type to a 300-dpi printer such as the GCC PLP II, you need a 48-point bit map (300 is roughly 4 times 72; 48 is 4 times 12).

SCREEN	ATM (Adobe Type Manager) and PostScript Type 1 Outline Fonts	PRINTER
With ATM you don't need a separate bit-mapped font for each point size. You do need to install a bit-mapped font for at least one point size, along with a Type 1 PostScript outline (printer) font, for each typeface you want to display. At point sizes for which bit-mapped fonts are installed, the Mac uses the bit maps to display characters on the screen. At all other sizes, ATM uses the outline font to create the display, eliminating jaggies.		With ATM you can print high-quality type on a non-PostScript printer at any point size, because ATM uses the same font outlines as a PostScript printer does to create printed output. Instead of the PostScript processor in your printer doing this work, ATM does it in the Mac, taking full advantage of the printer's resolution. However, ATM can do this only for typefaces for which you have outline (printer) fonts installed on your Mac.

SCREEN	TrueType INIT and TrueType Outline Fonts	PRINTER
TrueType works in much the same way as ATM does. You must install TrueType outline fonts for each typeface you want to display. Although you need not install any bit maps, the Mac uses bit maps to display type at sizes for which bit-mapped fonts are installed. If ATM and both PostScript and TrueType outline fonts are installed for the same typeface, the Mac will use the TrueType outline to create the screen display.		TrueType lets your Mac print high-quality type to non-PostScript printers in typefaces for which you have TrueType outline fonts installed on your Mac. If you have PostScript as well as TrueType outline fonts installed on your Mac for the same typeface, the Mac will use the TrueType outline to print to non-PostScript printers (although it will use the PostScript outlines to print to PostScript printers).

Table B: Type Samples

	Macintosh screen display (72 dpi)	Apple ImageWriter II output (144-dpi dot-matrix)	Hewlett-Packard DeskWriter output[†] (300-dpi inkjet)	Apple StyleWriter[§] (360-dpi thermal inkjet)	Apple Personal LaserWriter LS[§] (300-dpi laser)	QMS-PS 410 (Adobe PostScript)[◊] (300-dpi laser)
Bit-mapped fonts* (9-, 10-, 12-, 14-, 18-, and 24-point Times Roman installed)			wxyz wxyz Z	NA	NA	wxyz wxyz Z
Adobe Type Manager/ PostScript outline fonts (10- and 12-point Times Roman bit-mapped and PostScript Times Italic and Times Bold Italic outline fonts installed)		wxyz wxyz Z	wxyz wxyz Z	wxyz wxyz Z	wxyz wxyz Z	wxyz wxyz Z
TrueType outline fonts (Times Italic and Times Bold Italic TrueType outline fonts installed)		wxyz wxyz Z	wxyz wxyz Z	wxyz wxyz Z	wxyz wxyz Z	wxyz wxyz Z

*When only bit-mapped fonts were installed, the spacing on the screen and the ImageWriter output were so distorted that we had to move the large Z to see all the 8-point characters.
[†]We used HP's custom outline fonts to print this sample.
[§]Because the StyleWriter and the Personal LaserWriter LS ship with TrueType outline fonts, we didn't test their output quality with only bit-mapped fonts installed.
[◊]An interesting note: The lowercase Times Italic z from Adobe differs from the same character in Apple's TrueType font. The latter has a swash; the former doesn't.

Table B: MacUser Labs output samples of 8-point Times Italic and Times Bold Italic and a single character of 250-point Times Bold Italic on a variety of printers. (The middle-sized z in the upper right corner of each sample is a 400-percent enlargement of the 8-point Times Bold Italic z.) On each printer, we first used bit-mapped fonts only, then ATM with PostScript outline fonts, and finally TrueType fonts. As is obvious from the type samples, prior to ATM's release, type on-screen and printed to non-PostScript printers left something to be desired — quality. As for a quality comparison between ATM/PostScript and TrueType, see if you can tell the difference.

clear, however — the jaggies associated with pre-ATM screen displays and printer output deserved to be laid to rest. How did we ever live with that stuff for all those years — and like it?

OK, so which is faster? It looks like a draw. Our stopwatch testing of one application, a print preview in Excel 2.2a, showed ATM to be slightly faster — it took ATM 30 seconds to preview a page on a Classic, versus 36 seconds for TrueType — but Apple claims that TrueType is faster in some other situations.

For those of you who are worried about how peacefully TrueType fonts will coexist with your current bit-mapped and PostScript fonts, our beta tests indicate that you have good reason. The leading, character widths, and kerning for Apple's Times and Helvetica TrueType fonts don't always match those of its equivalent bit-mapped fonts. And if you're using ATM (which also doesn't always match Apple's bit-mapped equivalents), you may find these discrepancies to be even greater if you switch to TrueType. The result is that documents you've formatted with Apple's bit-mapped fonts or with ATM may need to be reformatted when you use TrueType fonts, or line endings and page breaks may change. Both Fifth Generation's Suitcase II

(version 1.2.8) and ALSoft's MasterJuggler (version 1.53) support TrueType fonts.

Do you need TrueType? If you aren't using ATM, it's a definite winner. It may slow down your screen display and printing slightly — it takes more time for TrueType to create characters than it takes to display or print old-style bit maps — but type on both your Mac screen and in your printed output will look a *whole* lot better, especially at large sizes. If you already have ATM installed, you may not need TrueType. It won't hurt anything to install it, but there's no rush. You'll get it automatically when you make the switch to System 7.0 anyway.

New Apple Printers

RAM, it's enough to contain the compressed image of nearly any 8.5-x-11-inch page you care to send it (see the "How It Works: Personal LaserWriter LS Compression" sidebar).

Apple also played some fancy tricks to keep the speed of the data connection from a Mac to an LS high while keeping costs low. Instead of the fast (but expensive and difficult-to-use) SCSI connection of the Personal LaserWriter SC, the LS uses a standard serial connection. The printer externally clocks the Mac's serial port to achieve an amazing 909-kilobit-per-second data-transfer rate, almost four times the speed of the Mac's built-in LocalTalk-network circuitry.

In addition, unlike the StyleWriter, the Personal LaserWriter LS *can* work with Apple's PrintMonitor spooler. The result: You regain control of your Mac in roughly one-tenth the time you would have to wait without background spooling. You have to be running MultiFinder to take advantage of PrintMonitor — which might mean purchasing a RAM upgrade for your Mac. It's worth it.

All this is unseen and unintrusive to users. What matters is the output quality and performance. Quality is comparable with that of other printers that use the four-page-per-minute LBP-LX engine, such as GCC's PLP II. However, despite the LS' innovative compression and serial-transfer-rate technology, the GCC PLP outperforms the Personal LaserWriter LS. The PLP was 20 percent faster than the LS on our Word test document, 40 percent faster on our MacDraw II test, and twice as fast on our Excel test.

Given that these two printers will probably be around the same price on the street (as we went to press, GCC told us that it was lowering the price of the PLP II to $999), the PLP II appears to have an edge over Apple's newest low-cost laser offering. A final point worth noting: The PLP II can be upgraded to a PostScript printer with a controller-board

Figure 4: The Personal LaserWriter LS looks from the outside like its predecessors, the Personal LaserWriter NT and SC. However, the LS' controller board (front) is much smaller than the typical printer controller.

swap; the Personal LaserWriter LS cannot, although once again, adding a PostScript emulator such as Freedom of Press is an alternative.

The Third Shoe

At press time, Apple planned a third printer announcement: Prices were to be cut on most of the remaining players in the printer lineup, anywhere from 11 percent for the LaserWriter IINT to 21 percent for the Personal LaserWriter NT (see Figure 3). The only exceptions to the price cuts are the ImageWriter II (whose sales will likely be limited to just the niche applications mentioned earlier) and the SC — which, although not being discontinued (yet), will likely not be aggressively marketed, as the Personal LaserWriter LS appears to be an improvement on all counts.

With these new prices, we can draw three conclusions: (1) Apple is finally providing competitive printer options at every important price/performance point. (2) The Apple logo no longer necessarily means that you're paying a premium price for peripherals with me-too performance. Many users will opt for the logo. (3) When Apple lowers its prices, third-party manufacturers are quick to follow suit. Printer manufacturers, including Abaton, GCC, Texas Instruments, and Hewlett-Packard, have announced a wave of price cuts. The year 1991 is shaping up as the year of higher-quality printing for less money. ▓

Between them, MacUser editor Jon Zilber and technical director Henry Bortman have employed more printers than Stephen King and Danielle Steel.

The Bottom Line

Apple's two newest printers go a long way toward filling out the company's printer lineup at the low end while at the same time offering some real innovation.

The thermal inkjet **StyleWriter** ($599), in addition to sporting one of Apple's most innovative designs, makes a huge leap in the quality of output (360 dpi) over the similarly priced ImageWriter (72 dpi). There's a big caveat, though: The StyleWriter is as slow as or slower than its dot-matrix cousin when used with low-end Macs such as the Classic. Classic owners can expect to see Excel documents, for instance, take twice as long to print from a StyleWriter as they do from an ImageWriter.

Apple's other new printer is the **Personal LaserWriter LS** ($1,299), which offers performance equivalent to that of the Personal LaserWriter SC for $700 less. A clever compression scheme enabled Apple to lower the price without sacrificing speed. Apple's innovation has already had one beneficial side effect: Other manufacturers have moved to lower their own prices to competitive levels.

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reading this might need a
junior art director with some
hot Mac experience.

M. Sprong
Forney, TX

Some People Never Learn
In your December '90 review of Fastback II you said it's a good idea to backup all the

Apple is abo
to change
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printers.

It used to be if you wanted a genuine Apple® printer (and all the privileges that go with it), you basically had a choice between two extremes. You could spend a little and get an ImageWriter® II. Or you could spend a lot and get a LaserWriter.®

Not anymore. As of today, Apple offers a complete family of affordable printers:

The new Apple StyleWriter® is a 360-dpi laser-quality printer that combines a price almost anyone

With the addition of the new Apple StyleWriter and Personal LaserWriter LS, everyone has the right to a great image.

can afford with the kind of innovations only Apple can deliver. It's small. It's quiet. It utilizes TrueType™ (Apple's new font technology that lets you scale and print characters smoothly and precisely, from the smallest footnote to the most enormous headline). Yet it costs just $599.* So it's great for students, people working at home, small businesses, or anyone who needs confidentiality when they're printing.

The new Personal LaserWriter LS is a full-fledged, no-compromises, four-page-per-minute LaserWriter. It uses a built-in, high speed serial port, so it won't be slowed down by complicated pages. It also incorporates TrueType. It prints in the background, so you can be working at the same time it is. And it offers a major breakthrough for a LaserWriter: a price of just $1299.

And while our other laser printers aren't new, many have new, affordable prices:

The Personal LaserWriter NT is our least expensive, networkable PostScript® LaserWriter. It's ideal for complex graphics. And for small groups of people.

The LaserWriter IINT is our most popular PostScript LaserWriter. A workhorse that prints up to eight pages per minute, and one that can be upgraded to a IINTX.

The LaserWriter IINTX is our highest performance, expandable PostScript laser printer. One that's become the benchmark against which all other printers are measured. And that, on a large network, is actually our most affordable printer.

Of course, there's also the trusty ImageWriter II. It's a dot matrix printer that's been proven to be extremely reliable. It's capable of working over a network. And it's still the best bet for running multiple-part and continuous forms.

Your authorized Apple reseller will help you find the one that's right for you. If you need help finding a reseller, give us a call at 800-538-9696, extension 615.

Because now more than ever, everyone has the right to a great image. The power not just to look your best. The power to be your best.®

FAST,
FULL-FEATURED
Fax Modems

*You already own
a state-of-the-art
fax machine:
your Mac! All
you need is one
of these six
high-speed fax
modems.*

●

**BY
OWEN W.
LINZMAYER
AND THE
MACUSER LABS
STAFF**

PHOTOGRAPHY: FRED STIMSON

fax machine is the latest office necessity. No more waiting for the antiquated postal service — and no more "I mailed it to you yesterday" excuses. Instead, you can save time and money simply by faxing documents to clients across town or around the world. What could be easier? Well, how about skipping the paper-document step entirely and sending a fax directly from your Mac? Your client's fax machine will print your message in the same way as it does a standard fax — except that the output will look significantly sharper and more professional.

Sounds great — at least in theory. Until recently, however, we've recommended that you stick with old-fashioned paper faxes. When MacUser Labs last tested fax modems (see "The Fax Factor," August '89, page 148), the three candidates were plagued by slow transmission and printing speeds and network incompatibility. We strongly

suggested waiting for the next generation of products. Almost two years and many products later, we're happy to report that the wait's been worth it. Fax modems today are faster and less expensive, and they sport many features that were once exclusive to a few select products. Although not yet perfect, fax modems have come of age.

Because it can draw on the brains of your Mac, even the most basic fax modem offers a host of sophisticated standard features — speed dial, scheduled transmissions, and automatic redial, for example — that are expensive options on paper-based fax machines. What's more, faxes sent via modem look great, because you don't experience the degradation of image quality that you do with paper-based fax machines and because the image can't be skewed by an off-center misfeed.

If you create most of the documents you send on your Mac, a fax modem will serve you well. Other documents

need to be digitized by a scanner first. But don't buy a scanner just for faxing — the cost of a scanner plus a fax modem easily outstrips the price of a well-outfitted stand-alone fax machine, which does the job *much* more conveniently (see "An Inside Look at Scanners," September '90, page 132).

So — which fax modem should you buy? One initial piece of advice: Choose one with a fast fax-transmission speed (9,600 bps) and a data-transmission rate of at least 2,400 bps. We tested six, ranging in price from $449 to $1,099, that have the ability to send and receive both faxes and data at these high speeds. These were the Abaton InterFax 24/96, Computer Friends LightFax 9624, Cypress Research FaxPro, Dove Computer DoveFax, Orchid Technology OrchidFAX, and Prometheus Products MaxFax. The Abaton InterFax 24/96's data performance is enhanced by its inclusion of the MNP (Microcom Networking Protocol) Class 4 error-

correction and Class 5 data-compression protocols. These popular protocols enable the InterFax 24/96 to send guaranteed-clean data at speeds well above 2,400 bps — but only to other modems that also use the MNP Class 4 and 5 protocols (see "Thoroughly Modern Modems," January '91, page 100).

Although many slower (and cheaper) fax modems are available, their 4,800-bps fax-transmission speeds translate into higher phone bills, soon canceling out any initial savings — and causing finger-drumming aggravation as well. And if you don't think you'll ever want your Mac to receive a fax, you can buy a *send-only* fax modem (see the "One-Way Fax" sidebar).

We judged each fax modem for document-conversion efficiency, transmission speed, printing speed, image fidelity, ease of use, and the ability to handle telephone-line impairments. Furthermore, we pass/fail-tested each modem's data-sending

One-Way Fax

Don't be surprised if you get a postcard from your modem vendor, offering you a send-only fax upgrade for surprisingly little money. Many chip vendors — such as Sierra Semiconductors, Rockwell Communication Systems, and Exar — have added send-only fax capability to their modem chips at relatively little extra cost. If you don't need to receive faxes — or if you already have a fax machine — a send-only fax modem is an inexpensive way to have send-and-receive data and outgoing-fax capabilities in one package. Several companies currently offer send-only fax modems, and many more products are on the way.

The Anchor 24E Mac Pac ($235) is an external 24/96 send-only fax modem from Anchor Automation that features auto-dial/auto-answer and separate data and fax directories. Anchor Automation, 20675 Bahama Street, Chatsworth, CA 91311; (818) 998-6100.

The DataLink LC ($349) is an internal fax modem from Applied Engineering, announced recently at Macworld and designed for — what else? — the Mac LC. Because the LC has only one internal slot, Applied Engineering is doing what a lot of card vendors are doing — it's building more functionality into a single card. Hence the DataLink LC has a place for you to add the math-coprocessor chip the LC is missing. The DataLink LC also comes in a V.42bis-supported version for $379. (V.42bis is the most recent data-compression standard from CCITT.) Applied Engineering, P.O. Box 5100, Carrollton, TX 75011; (214) 241-6060.

By the time you read this, CMS Enhancements should be shipping the MiniFAX ($349), a pocket-sized 24/48 send-only fax modem with software for the Mac and IBM-compatibles. CMS Enhancements,

2722 Michelson Drive, Irvine, CA 92714; (714) 222-6000.

The Eddy-award-winning TelePort data modem, from Global Village, now ships with send-fax software. (Current TelePort owners can upgrade for $60.) The TelePort/Fax ($265) is a compact package that plugs into the ADB (Apple Desktop Bus) port rather than the modem port and sends data at 2,400 bps and faxes at 4,800 bps. Global Village, 1204 O'Brien Drive, Menlo Park, CA 94025; (415) 329-0700.

The Magic 2400/4800 SendFax ($99) and Magic 2400/9600 SendFax ($149) are two send-only fax modems from MacProducts USA. MacProducts also offers an upgrade path from the Magic 2400/4800 SendFax to the Magic 2400/9600 Send & Receive fax modem. Look for a voice-mail-chip upgrade ($50) that will turn your Magic 2400/9600 Send & Receive fax modem into an answering machine. MacProducts USA, 8303 Mopac, #218, Austin, TX 78759; (512) 343-9441.

Prometheus offers two new send-only modems: the TravelModem ($299), an internal 24/96 fax modem for the Mac Portable, and the ProModem 24/96 MiniFax ($299), an external for the rest of the Mac series. Both packages include MacKnowledge and MaxFax software, fonts, and cables. Prometheus Products, 7225 S.W. Bonita Road, Tigard, OR 97223; (800) 477-3473 or (503) 624-0571.

Two other fax bargains: The MX2400S/48 ($149) and the MX2400S/96 ($169) are external 4,800-bps and 9,600-bps send-fax modems from Zoom Telephonics. Both come with QuickLink II fax and modem software and seven-year warranties. Zoom Telephonics, 207 South Street, Boston, MA 02111; (800) 631-3116.

— Darryl Chan and Stephen Satchell

SiliconBan
95 Camino Rea
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SiliconBan
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Figure 1: A fine-resolution fax message (at 203 x 196 dpi) contains twice as much data as a standard-resolution fax (203 x 98 dpi), so it takes longer to send. But fine-resolution faxes (right) look much better than standard-resolution documents (left).

capability, simply to find out if it worked as advertised. In this year's fax fox-trot, a few products came close to dancing off with a perfect score — but a couple of entrants stumbled.

Fax Groupies

Like a regular data modem, a single-user fax modem is a hardware device that plugs into the Mac's serial port on one end and a telephone jack on the other (for a look at networkable fax modems, see the "Networking Fax" sidebar). Not only can a fax modem send data over the phone lines between computers but it is also capable of trading documents (facsimile transmissions) with fax stations — other fax modems or stand-alone fax machines. You can easily exchange documents with millions of fax stations worldwide thanks to agreement among manufacturers on a common standard, or fax *protocol*.

In the early 1980s, the CCITT (the French acronym that stands for the International Consultative Committee on Telephone and Telegraph, which is

an international standards committee based in Geneva) established a digital-communications standard called Group 3. With its data-compression scheme and maximum transmission speed of 9,600 bps, the Group 3 protocol lets most fax machines transmit a full page in less than a minute — several times faster than the analog-transmission rates of the earlier Group 1 and 2 standards. Furthermore, Group 3 offers

greater resolution — 203 x 98 dpi in Standard mode or 203 x 196 dpi in Fine mode (see Figure 1).

The CCITT's new Group 4 protocol is even more advanced, but its widespread use must wait until the world's phone lines are upgraded to ISDN (integrated-services digital network), a high-speed, all-digital standard that isn't yet available on a wide scale — and don't hold your breath. Thus, the lingua franca of modern faxing is still Group 3. Although many modern stand-alone fax machines are compatible with the earlier standards, the six fax modems evaluated this month can talk only to other Group 3 fax stations. Unless you plan to communicate with clients saddled with antiquated equipment, chances are that this won't present a problem.

Software Solution

Unlike fax machines, whose features are built in to hardware, fax modems use software to handle tasks such as automatic dialing, broadcasting, and polling. You needn't worry about your modem's quickly becoming obsolete, because improvements in features and performance involve software revisions rather than expensive hardware upgrades.

A fax modem comes with three vital pieces of software: an INIT (startup document) for background sending and receiving; a fax application program for viewing, printing, and otherwise

Figure 2: With their Chooser-selectable printer drivers, fax modems let you specify options such as print quality, page range, and the recipient's fax number from within most standard applications' Print dialog boxes.

manipulating faxes; and driver software that tells the Mac to treat the fax modem just like a printer or any other Chooser-selectable output device. To make a fax, you simply "print" the document — be it plain text or a sophisticated DTP piece — from the application to the fax modem. A dialog box similar to the Print dialog box lets you specify options such as print quality, page range, and the recipient's fax number (see Figure 2).

When the print operation has begun, however, a fax modem doesn't simply spit a document complete with fonts and formatting codes onto the phone line. The receiving fax machine can't tell fonts from graphics — it deals strictly in black and white dots. The first step, therefore, must be to translate the document into a bit-mapped image.

Because fax modems transmit documents as bit maps, recipients can't use a word processor to edit a fax message after it's been received by their fax modem. To turn a fax message into an editable word-processing file, you must first save it as a TIFF file and then convert it to text with OCR (optical character recognition) software such as Caere's OmniPage. Several manufacturers are looking into bundling OCR packages with their modems, although none of them would hint at when they'd be so helpful. Our

preliminary tests showed that fax-modem-to-fax-modem transmissions could be very successfully converted into text by OCR packages. However, if a fax message originated from a standard fax machine and was even slightly skewed at transmission, satisfactory results might be more difficult to obtain.

But back to sending a message. When you choose Print from the File menu, you give control of the Mac to the fax driver, which first saves a bit-mapped QuickDraw description of each page of the document to a temporary disk file. The driver then uses a CCITT-approved compression technique to reduce the amount of data to be transmitted over the phone line by up to 90 percent. Only after the document has been converted into this compressed-fax-file format — a process that can take more than a minute per page — do you regain control of the Mac.

Unfortunately, current fax software is incompatible with print spoolers, so you can't use a spooler to get back to work any faster. This may seem to be a hassle — but it's still quicker than printing a document, walking down the hall, and then waiting your turn at the office fax machine. Cypress Research promises that the FaxPro 2.0 will soon allow background document-to-fax conversion — you'll regain

control of your Macintosh once the QuickDraw description has been spooled to disk, a process that usually occurs in seconds (see the "On the Horizon" sidebar).

Dropping the Dime

With older fax modems, you had to wait for the fax modem to do its dialing, handshaking, and sending to the recipient's fax station before you could regain control of your Mac. Fortunately, fax modems nowadays handle the details of transmission and reception more efficiently. The actual sending of the fax message occurs in the background — even without MultiFinder. Although it's possible to proceed with your work as the fax software toils in the shadows, it's best to avoid any CPU- or disk-intensive tasks, because the fax modem may starve for data and abort the transmission. Simple word processing, for example, should work just fine, whereas sorting a database might cause you some problems.

Fax modems typically send a document immediately after the driver has converted it into fax format, but you can also schedule transmissions for a later time or date — to take advantage of lower phone rates, for example. With many fax modems, you simply specify the send time in the Print dialog box. (Be sure your Mac is

Networking Fax

The Mac's built-in LocalTalk-network capability is one of its strongest assets, as it lets workgroups share printers, file and mail servers, and other networked devices — such as fax modems. The Computer Friends LightFax 9624 and the Cypress Research FaxPro have software that turns a single fax modem into a shared, networkable device. You first install *fax-client* software on all the Macs on your network and *fax-server* software on your print or file server. You then create two folders (one for incoming faxes and one for outgoing ones) on your network file server, plug the fax modem into the server Mac's modem port and the phone line into the phone jack, and away you go. Sending a fax is virtually the same as sending one from a single-user fax modem.

Sending faxes out through a network works well, but receiving incoming faxes presents a problem — who gets each message? Currently, there is no software that can route an incoming fax automatically, but several vendors are studying this problem.

Nonetheless, network fax modems show great promise and should be considered for medium- to large-sized departmental networks.

An alternative to a network fax modem is to use your existing E-mail system to send faxes. Solutions' FaxGate ($395) works with Microsoft Mail or CE Software's QuickMail and lets you send mail via BackFAX (running on your server) through your network to a fax station. You can create standard E-mail and send it to a fax phone number in addition to sending it to people on your mail system.

If you want to send fully formatted faxes over E-mail, use FaxGate's MailMaker software. This utility takes output from your word processor, spreadsheet program, DTP package, or other LaserWriter-compatible software and sends it as a true fax. Using MailMaker and FaxGate provides the same functionality as using network fax software such as that supplied by Cypress Research. Incoming faxes can be printed automatically or viewed on a MailMaker-equipped Mac.

— Stephen Satchell

Figure 3: Magnification


```
≡□         Sample Fax         □≡
   With some reservation, we recommended the InterFax to those anxious to jump on the fax
modem bandwagon back then, but strongly suggested waiting for the next generation of
products. Well, they're here now and we're happy to report that it was definitely worth the
wait. Apple and STF have both bowed out of the fax modem market, five other manufacturers
have taken their place, and Abaton released an improved InterFax that's theoretically twice
as fast as its predecessor.
Magnification 100%
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≡□         Sample Fax         □≡

ow and we're happy to report th

th bowed out of the fax modem

Magnification 300%
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Figure 3: Because fax resolution — whether standard or fine — is higher than QuickDraw's 72 dpi, small type is barely legible on-screen when viewed at actual size (top). Thus, fax applications should offer a variety of view magnifications (bottom), as does the Abaton InterFax 24/96.

running at the specified time.) The fax INIT will kick in at the designated time and send the document automatically in the background, even if you are working in a different application. (See the "Fax-Modem Goodies" sidebar for information about automatic wake-up utilities.)

Yet another transmission feature is *enveloping*, which means placing several fax-formatted files in an "envelope" to be sent as a single fax transmission. For example, you might send a client a word-processed proposal along with an architectural drawing. Only the InterFax 24/96, LightFax 9624, and FaxPro feature true enveloping. The OrchidFAX and MaxFax first save a document as a fax file and then append additional documents to that file. Unfortunately, there's no way to reorder the documents once they have been appended.

The DoveFax provides a *call-grouping* option — whenever the DoveFax initiates a fax transmission,

it gathers any other faxes heading for the same phone number and sends them all as one transmission. Call grouping is a useful feature, but Dove should have included it as a complement to enveloping, not as a replacement for it.
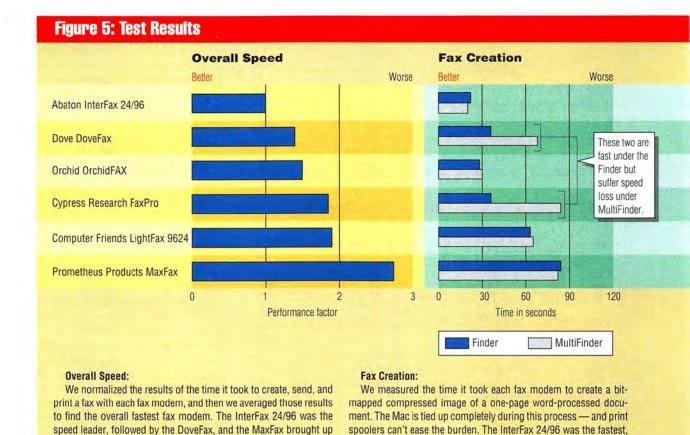
Wide Receivers

You needn't run a fax application to receive a fax: When the phone rings, the modem answers and unobtrusively stores the fax to disk. Unless you've specifically requested to be notified of incoming faxes, you continue working uninterrupted. Faxes take up lots of disk space, however — a one-page business letter may be 40K, and graphics-heavy documents can easily gobble up more than 100K per page. Fax software stores inbound faxes in proprietary formats, so you need the appropriate fax application to view the faxes you receive — and you need patience as you wait for each fax file to be converted to QuickDraw for screen display.

Because fax resolution is higher than that of the Mac's 72-dpi screen, most faxes with small type are illegible when viewed on-screen at actual size (see Figure 3). You'll want to magnify your incoming fax to read it. Except for BackFAX, bundled with the OrchidFAX, all fax applications have multiple view-magnification options. Also useful is the ability to flip a fax 180 degrees — in case it was sent to you upside down, as might happen with a standard fax machine. The LightFax 9624 and the OrchidFAX both lack such an option.

Fax applications only let you view, print, or forward fax documents. To

Figure 4: MacUser Labs technicians Tony Bojorquez (right) and Stephen Satchell used a telephone-network simulator from PTT (Processing Telecom Technologies) to simulate four different line conditions while using each fax modem to transmit to a Ricoh 1010L plain-paper fax machine.

Figure 5: Test Results

Overall Speed   **Fax Creation**

Better   Worse   Better   Worse

Abaton InterFax 24/96

Dove DoveFax

Orchid OrchidFAX

Cypress Research FaxPro

Computer Friends LightFax 9624

Prometheus Products MaxFax

These two are fast under the Finder but suffer speed loss under MultiFinder.

0   1   2   3   0   30   60   90   120

Performance factor   Time in seconds

Finder   MultiFinder

Overall Speed:
We normalized the results of the time it took to create, send, and print a fax with each fax modem, and then we averaged those results to find the overall fastest fax modem. The InterFax 24/96 was the speed leader, followed by the DoveFax, and the MaxFax brought up the rear.

Fax Creation:
We measured the time it took each fax modem to create a bit-mapped compressed image of a one-page word-processed document. The Mac is tied up completely during this process — and print spoolers can't ease the burden. The InterFax 24/96 was the fastest, followed closely by the OrchidFAX. The DoveFax and FaxPro were

further manipulate an image, you must export it to third-party applications. Except for that of the Cypress Research FaxPro, all fax applications can convert fax files to TIFF or other standard graphics formats recognizable by painting and page-layout application software.

Fancy Features

In addition to these basic features, fax-modem software programs offer capabilities (see Table 1) — activity reports, phone directories, and cover pages, for example — that are usually optional on stand-alone fax machines. All automatically create a fax-activity report — great for "Yes, we sent that purchase order on Tuesday" confirmation. Unfortunately, the software that comes with the LightFax 9624 and the MaxFax doesn't let you export the report. Although the DoveFax

software can export the log, it presents the information in a poorly organized fashion.

The FaxPro software allows only one directory, but all other fax-modem programs let you create multiple directories with frequently called names and fax-machine numbers. You can group individuals and then broadcast a fax to the entire group with a single command. With the InterFax 24/96, LightFax 9624, FaxPro, and MaxFax, you can import from existing databases — there's no need to start from scratch.
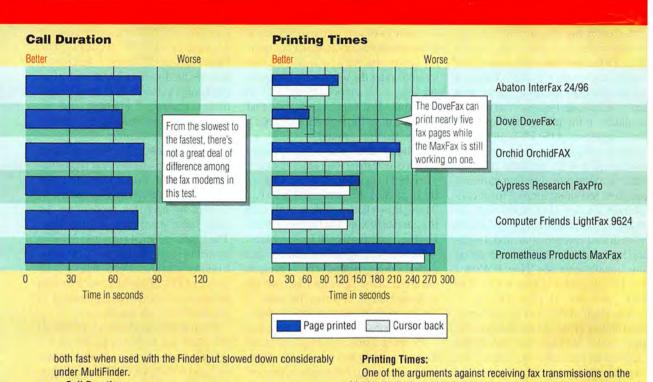
The ability to generate cover pages — with names, phone numbers, and number of pages — to accompany outgoing faxes is a particularly useful feature. All six fax-modem packages can create cover pages, but only the LightFax 9624, DoveFax, and OrchidFAX let you add custom text and graphics.

Test Results

MacUser Labs has developed an extensive set of benchmarks to test not only fax-modem performance but document quality as well. We used two different one-page documents: To test speed, we sent a one-page Microsoft Word business letter; to test image fidelity, we transmitted an Aldus PageMaker composite document containing an 8-bit gray-scale TIFF image, a 1-bit PICT line-art object, and various-sized text samples.

We generated all the faxes—at both standard and fine resolution — on a Mac SE/30 and sent them via a PTT (Processing Telecom Technologies) telephone-network simulator to a plain-paper Ricoh 1010L fax machine. Although the results represent averages of multiple tests, real-world times may vary greatly, depending on several factors: the type of document being

Call Duration

From the slowest to the fastest, there's not a great deal of difference among the fax modems in this test.

0   30   60   90   120
Time in seconds

Printing Times

The DoveFax can print nearly five fax pages while the MaxFax is still working on one.

Abaton InterFax 24/96

Dove DoveFax

Orchid OrchidFAX

Cypress Research FaxPro

Computer Friends LightFax 9624

Prometheus Products MaxFax

0   30   60   90   120   150   180   210   240   270   300
Time in seconds

■ Page printed   □ Cursor back

both fast when used with the Finder but slowed down considerably under MultiFinder.

Call Duration:
The amount of time a modem spends with the phone off-hook determines the cost of a fax transmission. The DoveFax performed the best, and all the others did a respectable job.

Printing Times:
One of the arguments against receiving fax transmissions on the Macintosh is that, with the single exception of the DoveFax, every fax modem takes a considerable amount of time to print even a simple one-page business letter. Our tests used a LaserWriter IINTX printer.

transmitted (text is faster to convert and send than graphics), the computer (more-powerful CPUs convert faster), the receiving fax machine (some are slower than others), telephone-line conditions (line noise can cause fallback to slower transmission speeds), and other software (Multi-Finder and INITs steal time from fax software during conversion and transmission).

Fax Creation. The first test measured the "hassle factor" — the total time from initiating a fax transmission until the cursor reappeared and we regained control of the Mac. This included the time required for the fax software to present various dialog boxes and then convert the Word document to a fax file. (Our technicians paused their stopwatches whenever human interaction, such as choosing resolution, page range, and

fax recipient, was required.)

The Abaton InterFax 24/96 under the Finder was the quickest, taking an average of 22 seconds from start to finish, with the Orchid OrchidFAX not far behind at 28 seconds (see Figure 5). The Cypress Research FaxPro and the Dove DoveFax tied in the middle of the pack at 36 seconds. The Computer Friends LightFax 9624 took almost twice as long, and last was the Prometheus Products MaxFax — the leader was nearly three times faster.

Running these same tests under MultiFinder, however, gave very different results. The DoveFax took almost twice as long — an average of 68 seconds — and the FaxPro took more than twice as long — an average of 84 seconds — under MultiFinder than they had under the Finder.

Call Duration. To keep telephone costs down, you must minimize the

time spent *off-hook* — the time the fax modem communicates over phone lines. Only after the modem and fax station have agreed, at the handshaking stage, on transmission variables — speed, resolution, and page width and length, for example — does actual fax transmission begin.

Sending the one-page business letter at fine resolution between two fax machines took only 40 seconds; sending the same letter via fax modem took almost twice as long. It was a tight race, but the DoveFax was the fastest. The MaxFax was the slowest, but Prometheus claims that the modem intentionally waits a little longer than others before sending each line so that the receiving fax machine can properly advance the paper. This might be an important consideration on older, presumably slower fax machines, but the Ricoh 1010L experienced no

problem keeping up with any of the fax modems.

Impairments. The timing tests discussed so far show the results we obtained when sending a document over a perfectly clean telephone line to a stand-alone fax machine. Such "best case" telephone lines are not always available in the real world, however, so we again used the PTT telephone-network simulator to send faxes between a pair of fax modems from the same manufacturer over four industry-standard test lines: a noisy local connection, a noisy land-based coast-to-coast connection, a terrestrial service with digital compression, and a satellite linkup. (For more information on line impairments, see "How It Works: An Encyclopedia of Phone-Line Defects," January '91, page 104.)

The OrchidFAX was the only modem that successfully sent the fax to its twin under all four line-impairment conditions, but quality suffered — the fax showed up with extraneous dots, streaking lines, and splotchy text. The EIA (Electronic Industries Association, a standards group that recommends specifications to CCITT) says that you can expect to encounter these types of line impairments on less than 5 percent of all calls in the U.S. Because the chances of getting two bad lines in a row are extremely low, it's not terribly significant that a fax modem failed to send under the worst-case scenario. As long as it automatically tries to resend the fax, chances are good that the fax will go through without a hitch the second time around.

Although the DoveFax failed to send over the terrestrial long-line service, it managed to generate the best-looking faxes on the other lines. The InterFax 24/96 did well also, failing only with the satellite linkup. The LightFax 9624, FaxPro, and MaxFax all had problems — broken text, squashed headers, and garbage dots, respectively — even on clean lines. Don't give too much weight to these results, however, because all the fax modems sent acceptable documents to our stand-alone fax machine.

Printing Time. Although most fax machines automatically print faxes while receiving, fax modems (except the LightFax 9624, which has an option for automatic printing) make you take an extra step. You must launch the fax application, open the fax document, send it to the printer, and then wait — and wait, and wait. Printing the one-page business document on a LaserWriter IINTX took an average of 2 minutes and 40 seconds. The DoveFax was the fastest at just over 1 minute; the InterFax 24/96, LightFax 9624, and FaxPro turned in respectable times of about 2 minutes; and the OrchidFAX and MaxFax had slower-than-average print times.

Image Fidelity. To evaluate image fidelity, we scrutinized the reproduction quality of fonts and graphics on the PageMaker composite document as sent by each fax modem to our plain-paper stand-alone fax machine. The LightFax 9624 simply refused to print the composite page — Computer Friends acknowledged that it was aware of a PICT-sorting problem with certain applications and promised to address this in an update soon.

Even at sizes as small as 6 points, all the other fax modems produced excellent text output — no doubt because we used ATM (Adobe Type Manager) 2.0, which scales outline fonts with impressive results. For good-looking text without ATM, your System file must contain LQ (letter-quality) fonts — the same kind of fonts used with the

Fax-Modem Goodies

Every fax-modem owner eventually faces some grim facts about faxing. For one thing, sharing a fax modem with your telephone is not the most convenient office practice for, say, a small business: When the phone rings, how do you know who — or what — is calling? But unless you're a power faxer, you probably can't justify bringing in a dedicated phone line for faxing.

Fortunately, you don't have to. Technology Concepts' Fax Line Manager Model 202 ($169) intercepts the fax station's telltale beep and automatically determines whether an incoming call is fax or voice. If it's a fax, the Fax Line Manager routes the call to the fax modem — or machine — and you're not disturbed; otherwise, the telephone rings normally. Technology Concepts, 1159 Triton Drive, Foster City, CA 94404; (800) 349-0900 or (415) 349-0900.

Energy-conscious faxers have to deal with a second problem — leaving the Mac on at all hours in order to receive faxes. You can get around this with a Remote/WakeUp cable ($49.95), from Farallon Computing. Plug one end of the cable into your fax modem's DB-25 connector (not present on the FaxPro or the DoveFax), and plug the other two connectors into the serial and ADB ports on the back of your Mac; then leave your fax modem in Auto-Answer mode. When someone calls you, the modem detects a ring and sends a "wake up" command to the Macintosh via the ADB port. After all your INITs have loaded during startup, the fax modem receives the incoming fax. (If it was a voice call, the software automatically turns off the Macintosh after a period of inactivity.) Farallon Computing, Inc., 2000 Powell Street, Suite 600, Emeryville, CA 94608; (800) 344-7489 or (415) 596-9000.

The Ringo ET ($69.95), from MacSema, works on the same principle as Farallon's Remote/WakeUp cable, but it powers up your Mac only *after* finding a carrier-detect signal on the line, thus eliminating false starts prompted by voice calls. Another useful product from MacSema is the WakeUp board ($199). You can program this NuBus device to turn on the Mac whenever you specify and automatically invoke a macro key to perform whatever tasks you desire. The WakeUp board is compatible with MacroMaker, QuicKeys, and Tempo, to name a few. Although it's useful for sending scheduled faxes when rates are low, the WakeUp board can also, say, initiate a midnight backup or a predawn E-mail download. After performing the specified tasks, the WakeUp board shuts everything down in an orderly fashion, saving documents and quitting applications cleanly. MacSema, 29383 Lamb Drive S.W., Albany, OR 97321; (800) 344-7228 or (503) 757-1520.

Figure 6: For the best-looking text, always use Adobe Type Manager (right) or letter-quality fonts such as those bundled with the Orchid and Prometheus modems. We also got favorable results with non-PostScript rasterizers such as Freedom of Press.

ImageWriter LQ—that are three times the size of those used in the document. For instance, if you use 12-point Helvetica, the software needs the 36-point font when it converts the document to Group 3 format. LQ fonts prevent the jaggies that occur when the fax software tries to compensate for the differing resolution of the Mac's screen (72 dpi) and the Group 3 protocol (203 dpi).

Only Orchid and Prometheus provide LQ fonts with their fax modems; the other vendors recommend using ATM, and MacUser Labs *strongly* seconds that recommendation (see "Designing for Fax," elsewhere in this issue). ATM gives you more font flexibility and improves the look of fonts displayed on-screen and sent to most output devices (see Figure 6). We also got excellent results with Freedom of Press, the popular software

PostScript interpreter. Using ATM or Freedom of Press, however, won't make incoming faxes look any better —they've already been turned into bit maps.

If you're going to send technical drawings, dimensional accuracy is probably important to you. Fortunately, the FaxPro and OrchidFAX software offers an Exact Size option in the Print dialog box — a welcome option, because most fax modems tend to squash or stretch pages to show text in its best form, at the expense of accurate graphics reproduction.

Only the MaxFax sent good-looking gray-scale graphics. MaxFax software creates a randomized halftone dither of the entire image, with stunning results. Sending the same gray-scale image with any other fax modem resulted in a high-contrast Rorschach-inkblot look-alike. (However, some

applications—such as PageMaker 4.0 —predither gray-scale images, so you may get acceptable results when sending PageMaker 4.0 files with other fax modems.) Gray-scale images take significantly longer to transmit than text or even line art, because very little compression is possible. Considering that the Mac is the preeminent graphics platform, we're surprised that gray-scale capability isn't part and parcel of every fax modem.

Data Capabilities. In addition to sending and receiving faxes at 9,600 bps, the fax modems we tested can perform double duty, with their Hayes-compatible 2,400-bps data capability. When you're not engaged in transmitting faxes, you can log on to on-line services such as CompuServe, GEnie, or any of the thousands of private bulletin boards across the nation. Of course you'll need telecommunications software to do so, and Computer Friends, Orchid, and Prometheus have thoughtfully provided workable capabilities. (By the way, the OrchidFAX can exchange regular Mac files with other OrchidFAX and AppleFax modems at 9,600 bps.)

To evaluate the data side of the fax modems, we used Software Ventures' MicroPhone II 3.0 to place a call to our local CompuServe access node, enter the Ziff-Davis Zmac Forum, and download a 12K utility from the software library. Each of the modems successfully weathered this pass/fail test. We then transmitted data files from modem to modem under simulated local and long-distance connections. All the modems worked well. As mentioned earlier, only the Abaton InterFax 24/96 includes the popular MNP Class 4 error-correction and Class 5 data-compression protocols.

Ease of Use

Don't assume that because a fax modem did well in our benchmark tests, it's easy to use. In fact, none of the modems approach the push-button simplicity of most stand-alone fax machines. Some features that would make life with a fax modem easier

aren't available in all the products. For example, you may want to scale a document before faxing it — but both the InterFax 24/96 and MaxFax send everything at 100 percent. This is particularly annoying if you want to send a large spreadsheet, for example, as a one-page document. And the lack of a Preview feature means that you can't be sure you're sending exactly what you want.

Because we experienced all manner of fax gremlins during testing, we came to appreciate feedback during fax activity. When it comes to providing information, the DoveFax wins hands down with its FaxStatus DA (see Figure 7). You know what's going on every step of the way. The InterFax 24/96 also keeps you well informed but only when you access the Control Panel to monitor fax activity. Most of the other fax modems leave you in the dark, some neglecting to display even
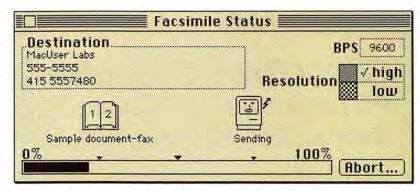
Figure 7: Dove's animated FaxStatus DA allows you to monitor fax activity, and it provides enough information for you to track down the cause of any problems that may occur.

the number of the fax machine on the other end of the line.

To use your fax modem for data, you'll want to switch freely between the Data and Fax modes. The InterFax 24/96, FaxPro, and DoveFax detect when you're using telecommunications software, and they switch to Data mode. When you have finished, they

automatically revert to Fax mode. With the LightFax 9624, OrchidFAX, and MaxFax, you must manually change modes through software.

A Resounding Yes — But . . .

When MacUser Labs last examined fax modems, our feeling was that the three products on the market at that

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On the Horizon

Many new 24/96 (2,400-bps data, 9,600-bps fax) modems were announced or began shipping after we finished our MacUser Labs fax frenzy. By the time you read this, Cypress Research should be shipping a new, improved FaxPro, the FaxPro 2.0 ($1,099), which features background conversion of transmitted and received faxes, an intelligent resending feature, more-flexible cover sheets, a tab-delimited and exportable activity log, and a host of other new capabilities. Our first-peek impression is that it's a vastly improved product. Cypress Research, 766 San Aleso Avenue, Sunnyvale, CA 94086; (408) 752-2700.

The COMplete Fax/Modem ($599) is an internal 24/96 modem from PSI Integration for the Mac Portable. The COMplete boasts incoming-call detection, which awakens the Mac from Sleep mode to catch any incoming fax messages. The COMport 5/42 ($699) is also an internal fax modem for the Portable; this model supports V.42bis and MNP Class 5 data compression. (V.42bis is the most recent CCITT compression standard, which provides a theoretical transmission rate of 9,600 bps, using a 2,400-bps modem.) PSI also plans to release an external version of the COMport 5/42, the COMStation ($799), with an optional voice add-on module ($149). PSI Integration, Inc., 851 E. Hamilton Avenue, Suite 200, Campbell, CA 95008; (800) 622-1722 or (408) 559-8548.

The MET 9624PF (Pocket Fax) modem is a 24/96 send/receive fax modem from Micro Electronic Technologies. The MET 9624PF is portable — it weighs less than 7 ounces and uses a 6-volt battery or AC adapter — and it supports the MNP Class 5 protocol and the V.42 standard. Micro Electronic Technologies, Inc., 35 South Street, Hopkinton, MA 01748; (508) 435-9057.

The OrchidFAX LT ($499) is an internal 9,600-bps-data and 9,600-bps-fax modem for the Mac Portable from Orchid Technology. It supports MNP 5 data compression and V.42 error correction. In Data mode, it lets you connect with other OrchidFAXes operating at 9,600 bps. Orchid Technology, 45365 Northport Loop W., Fremont, CA 94538; (800) 767-2443 or (415) 683-0300.

For those who want networkable devices, BackFAX/AppleTalk Version ($495) should be shipping by the time you read this. BackFAX/ATV will provide many of the same benefits as Solutions' FaxGate but doesn't rely on use with an E-mail system. The package includes server software and software for five users. Additional five-user software packages will be available for $195. If you already own the single-user version of BackFAX, you can trade up to BackFAX/ATV for $275 — even if your version came bundled with a modem. If you still have an old AppleFax modem, Solutions is selling BackFAX 1.5 software for the low, low price of $29 (plus $6 handling) — but hurry, this generous offer is good only until the end of June 1991. Solutions, Inc., P.O. Box 783, Williston, VT 05495; (802) 865-9220.

Finally, for shattering the speed limit, you might want to consider the Prometheus ProModem 9600M Plus ($995), a 9,600-bps-data and 9,600-bps-fax modem that supports the V.42 error-correction and MNP 5 data-compression standards. When connected to another MNP-supported modem, its theoretical speed limit is 19,200 bps — but don't expect such blazing performance on most transfers, because file compressibility and phone-line impairments lower actual speeds. The ProModem 9600M Plus automatically negotiates the highest possible setting with the modem you wish to call. Prometheus Products, Inc., 7225 S.W. Bonita Road, Tigard, OR 97223; (800) 477-3473 or (503) 624-0571.

— Darryl Chan

Fax modems have come a long way since our last report, but there's still room for improvement. Make sure the fax modem you're considering comes with an ironclad guarantee that you can return it and get your money back if you're not completely satisfied. During testing, our technicians tackled INIT conflicts, dodged erratic behavior, and negotiated Byzantine inhuman interfaces. Although we did — finally — get each product to work as advertised, your computer's unique hardware and software configuration may not mesh with a particular product.

Work your way down our list until you find a fax modem that works for you.

The **Dove DoveFax** ($449) takes top honors. It's an inexpensive gem that turned in a better-than-average fax-processing time, the shortest off-hook time, and the fastest printing time. It sent the cleanest faxes through impaired lines. When it failed to transmit, its FaxStatus DA provided plenty of information. The DoveFax is a polished product with only a few shortcomings to dampen our enthusiasm: Sending several faxes to different destinations is a hassle, because the DoveFax doesn't provide a true envelope capability, nor can it import or export a phone directory. (Dove plans to release a stand-alone application to address this last problem.) And DoveFax under MultiFinder was much slower at creating a fax than it was under the Finder.

The **Abaton InterFax 24/96** ($495) was the fastest at creating a fax and had the second-fastest regain-control and printing times, but it spent more time than average off the hook. Like the DoveFax, it performed well over impaired lines, and its documentation and user feedback are superlative. Modem jockeys will appreciate its automatic Fax-to-Data-mode switching and built-in MNP Class 4 error correction and Class 5 data compression. However, faxers may miss some key features — user-definable cover pages, a Preview mode, and scaling, for example.
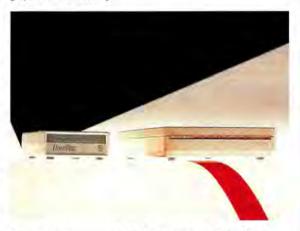
The **Cypress Research FaxPro** ($1,099) turned in better-than-average times in all our benchmark tests, but its software is a major liability. Also, creating a fax with the FaxPro under MultiFinder was much slower than doing so under the Finder. Version 2.0 of the FaxPro software should be out by the time you read this, and if it lives up to the impressive demonstration we saw at press time, the FaxPro will be hard to ignore, despite its lofty price tag.

Another modem in need of a software revision is the **Orchid OrchidFAX** ($599), which uses a custom version of Solutions' venerable BackFAX. Although Orchid thoughtfully provides LQ fonts, telecommunications software, high-quality documentation, and a warranty, it's not enough to overcome BackFAX's lack of features. Although the OrchidFAX can send Mac files at 9,600 bps to AppleFax and other OrchidFAX modems and has a fast regain-control time, it delivered below-average performance in the off-hook and printing tests and performed poorly over impaired lines. Furthermore, BackFAX doesn't support enveloping, magnification of received faxes, or import and export of phone directories.

The **Computer Friends LightFax 9624** ($549) took too long to prepare our business letter and just plain choked on the PageMaker composite document. Its software has all the earmarks of an IBM port, using "classes" and "cards" in the phone directory and saving each fax page as a separate DOS-suffixed file — but the disjointed, photocopied, and three-ring-bound documentation is the dead giveaway.

Bringing up the rear is the **Prometheus Products MaxFax** ($449), which finished last in our regain-control, off-hook, and printing tests. It lacks enveloping, scaling, previewing, and the ability to export the activity report. On the other hand, the MaxFax is inexpensive and comes with LQ fonts and a full-featured telecommunications application. The MaxFax also sent the best-looking (actually, the *only* good-looking) gray-scale images — it may be your only choice if gray-scale graphics are a necessity.

In overall performance, the DoveFax and the InterFax 24/96 virtually tied for first place, but the DoveFax (left) had shorter call-duration times. The InterFax 24/96, however, gave more consistent results under MultiFinder and the Finder.

time — the Abaton InterFax 12/48, Apple Computer AppleFax, and STF Technologies FAXstf — left a lot to be desired. We recommended the InterFax 12/48 to those anxious to jump on the fax-modem bandwagon but strongly advised holding off until the next generation of products.

In general, the new crop of fax modems is far superior to the old — faster, less expensive, easier to use, and bearing a host of standard features that were once exclusive to only a few select products. All the fax modems we tested let you schedule transmissions (so you can take advantage of after-hours phone rates); batch faxes from different programs together to send at one time; and receive faxes and store them to disk while you work, uninterrupted, in another program. Each also provides an activity report, at least one phone directory, and automatic cover pages. Some give you more flexibility than others in these features. To find out which modems we liked for what applications, see the "Bottom Line" sidebar; despite any flaws each product may have, you'll still find sending Mac-created documents directly from your Mac relatively efficient and even pleasant.

This Owen W. Linzmayer may appear to be the well-known San Francisco free-lance writer, but he is actually an amazing facsimile.

Table 1: Features of 24/96 Fax Modems

● = yes ○ = no	Abaton InterFax 24/96 ♨♨♨½	Computer Friends LightFax 9624 ♨♨	Cypress Research FaxPro ♨♨♨	Dove DoveFax ♨♨♨♨
Price (list/street)	$495/$412	$549/$399, stand-alone $799/$599, networkable	$1,099/$825, networkable $1,199/$899, FaxShare	$449/$289
Pros	Good regain-control and print times. MNP 4 and 5 data modem. Polling support.	Good print time. Inexpensive. Only fax modem with voice-call detection.	Good regain-control, off-hook, and print times. Exact Scale option.	Flexible cover pages. Fastest off-hook and print times. Good regain-control time. Compact size.
Cons	Long off-hook time. Inflexible cover pages. No preview or scaling from Print dialog box.	Slow regain control. No preview. Clumsy interface.	Inflexible cover pages. No graphics-conversion feature. Expensive for stand-alone use.	No enveloping. Can't import or export directory.
General				
Software version	1.20	2.13	1.00	1.1.1
Activity report	●	●	●	●
Print	●	●	●	●
Export	●	○	●	●
Auto data/fax switching	●	○	●	●
Transmission features				
Reduce/enlarge	○	●	●	●
Exact size	○	○	●	○
Preview	○	○	●	●
Polling	●	●	○	○
Enveloping	●	●	●	○
Call grouping	○	○	○	●
Phone directories	unlimited	unlimited	1	unlimited
Import directory	●	●	●	○
Export directory	●	●	●	○
User-definable cover page	○	●	○	●
LQ fonts provided	Times, Helvetica	none	none	none
Page sizes	letter, legal, A4, B4, A3, custom	letter, legal, A4, B5, custom (max. 8.5 x 14 in.)	letter, legal, A4, computer, fanfold, custom	letter, legal, A4, B5, half page, custom
Reception features				
Voice-call detection	○	●	○	○
Flip 180 degrees	●	○	●	●
Auto-print	○	○	○	○
Conversion	TIFF, PICT, paint	TIFF, paint	none	TIFF, PICT, paint
View magnification	5% – 1,200%	50%, 60%, 75%, 100%, 150%, 300%	10% – 400%	50%, 75%, 100%, 200%, 300%
Telecommunications software	none	QuickLink II	none	none
Size (W x D x H, in.)	6.5 x 10 x 1.75	6.25 x 10.25 x 1.75	5.75 x 10 x 1.75	3.75 x 6.25 x 1.5
Warranty	1 year	1 year, 30-day MBG	1 year, 30-day MBG	1 year, 30-day MBG
Company	Abaton 48431 Milmont Dr. Fremont, CA 94538 (800) 444-5321 (415) 683-2226	Computer Friends 14250 N.W. Science Park Dr. Portland, OR 97229 (800) 547-3303 (503) 626-2291	Cypress Research 766 San Aleso Ave. Sunnyvale, CA 94086 (408) 752-2700 (919) 763-7918	Dove Computer Corp. 1200 N. 23rd St. Wilmington, NC 28405 (800) 622-7627

Table 1: Features of 24/96 Fax Modems, continued

	Orchid OrchidFAX ♦♦♦	Prometheus Products MaxFax ♦♦½
● = yes ○ = no		
Price (list/street)	$599/$439	$449/$294
Pros	Fast regain-control time. Long-term warranty. LQ fonts. 9,600-bps data transfer with other OrchidFAX modems.	The only gray-scale-capable fax modem. Inexpensive. Good telecommunications software.
Cons	Long off-hook and printing times. No enveloping or magnification. Can't import or export directory.	Longest regain-control, off-hook, and printing times. Inflexible cover pages. No enveloping. Cannot export activity report.
General		
Software version	1.05	1.05
Activity report	●	●
Print	●	○
Export	●	○
Auto data/fax switching	○	○
Transmission features		
Reduce/enlarge	●	○
Exact size	●	●
Preview	●	○
Polling	○	○
Enveloping	○	○
Call grouping	○	○
Phone directories	unlimited	unlimited
Import directory	○	●
Export directory	○	●
User-definable cover page	●	○
LQ fonts provided	Courier, Symbol, Times, Helvetica	Courier, Symbol, Times, Helvetica
Page sizes	letter, legal, A4, B5, fax, tabloid, custom	letter, legal, A4, B5
Reception features		
Voice-call detection	○	○
Flip 180 degrees	○	●
Auto-print	●	○
Conversion	TIFF, PICT, paint, Glue	TIFF
View magnification	100%	75%, 100%, 200%, 300%
Telecommunications software	FreeTerm	MacKnowledge 1.02A
Size (W x D x H, in.)	5.5 x 10 x 1.5	6.25 x 11.5 x 3
Warranty	2 years	2 years, 30-day MBG
Company	Orchid Technology 45365 Northport Loop W. Fremont, CA 94538 (800) 767-2443 (415) 683-0300	Prometheus Products, Inc. 7225 S.W. Bonita Rd. Tigard, OR 97223 (800) 477-3473 (503) 624-0571

Criteria

Price (list/street) — The list price is the manufacturer's suggested retail price. The street price is an average actual price charged by dealers across the U.S. in January 1991.

Software version — Improvements in fax-modem features involve software revisions rather than expensive hardware upgrades.

Activity report — A list of all documents sent to and received from fax stations.

Auto data/fax switching — Automatic return to Fax mode after using the data-modem features.

Reduce/enlarge — Useful when you need to fax an oversized drawing.

Exact size — A fax modem may distort image proportions to send the entire image; an Exact Size option prevents any such changes.

Preview — This feature lets you view a fax before sending it out.

Polling — Calling a remote fax location and requesting a transmission.

Enveloping — Sending more than one fax from different programs in one transmission.

Call grouping — The fax modem groups all other faxes awaiting transmission to the same destination and sends them together.

Phone directories — Databaselike lists of names and phone numbers that ease the sending of faxes. Some fax-modem software lets you import an already existing database and export from the directory created with the fax-modem software.

User-definable cover page — The first page in any fax document. Some fax software lets you customize the look of the cover page with fonts and graphics.

LQ fonts provided — Letter-quality (LQ) fonts can improve the look of faxes you send in the absence of Adobe Type Manager.

Page sizes — What size pages can the fax modem send and receive?

Voice-call detection — Does the fax modem know when it's receiving a voice call rather than one from another fax station?

Flip 180 degrees — You may receive faxes sent upside down from a fax machine; being able to flip them over is a big help.

Auto-print — Can the fax modem initiate printing to a laser printer immediately on receipt of a fax?

Conversion — Good fax-modem software lets you convert faxes to other formats usable by other applications.

View magnification — Received faxes may be difficult to view at 100 percent because of the differences between fax and QuickDraw resolution. Good fax-modem software should let you enlarge received faxes.

Telecommunications software — Does the fax modem include software you can use to send data, or will you need to buy it?

Size (W x D x H, in.) — The case dimensions, rounded to the nearest quarter of an inch.

Warranty — Look for a money-back guarantee (MBG). Even the best fax modem may not mesh well with your particular hardware and software configuration.

PRINTING FROM MAC TO

LaserJet

The cheapest printer for your Macintosh is the one you already own. If you have an HP LaserJet, take a look at this guide to 16 printer cartridges, software packages, and specialized hardware products to make it compatible with your Mac.

●

**BY
JOHN RIZZO**

T he Hewlett-Packard LaserJet is the most popular laser printer. You can find LaserJet IIs and IIIs almost everywhere there are IBM-compatible personal computers. Although the LaserJet's output quality may not be as good as that of many Mac printers, it's probably good enough for the reports and memos that your office churns out by the ton.

Fortunately, there are several easy and inexpensive ways to enable your Macs to print to LaserJets. You can connect a LaserJet to a single Mac or to a network of Macs and PCs, with or without PostScript compatibility.

If your output is limited text, bit-mapped graphics, and other QuickDraw images, you don't necessarily need PostScript compatibility. For example, using standard HP font cartridges with special Mac software, you can print a wide variety of fonts and typographic styles and special effects without PostScript.

However, your options don't depend solely on your output needs; although some of the LaserJet-to-Mac connections are available only with PostScript, others don't support PostScript.

Whatever your configuration, by using the LaserJet you already own, you'll save enough money to pay for that Mac upgrade or jumbo hard-disk-drive purchase you've been putting off.

PHOTOGRAPHY: ROBIN GINSBERG

LaserJet Printers

Doing It the Mac Way

The easiest way to connect Macs to HP LaserJets is to add LocalTalk and PostScript (or a clone) to the printer, especially if you already have a Mac network. LocalTalk is the implementation of AppleTalk network protocols built in to every Mac, and PostScript is the standard page-description language used by every Mac application that prints to a PostScript printer. When you instruct a Mac to print something, it uses LocalTalk to send PostScript page descriptions to the printer. Once you've added LocalTalk and PostScript to a LaserJet, the LaserJet becomes simply another printer option when you click on the standard LaserWriter driver in the Chooser.
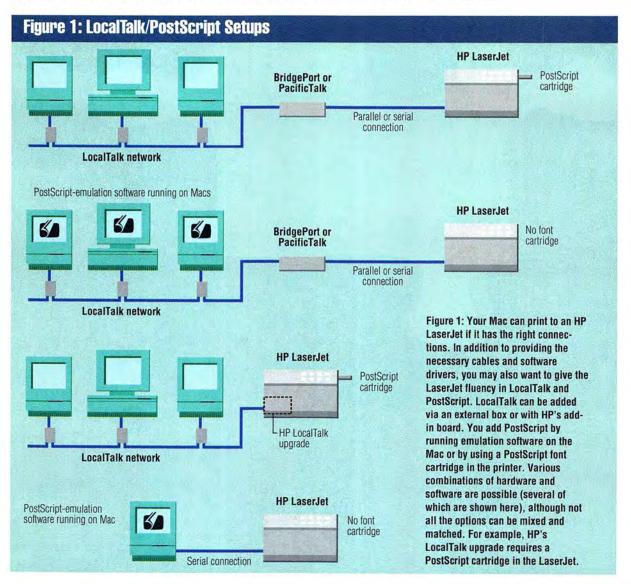
There are two ways to add Local-Talk to a LaserJet: Install HP's Local-Talk port (called the Interface Kit for AppleTalk/HP LaserJet), or add an external device that bridges the printer to the network. As for PostScript, you can do it the easy way — add a PostScript-font cartridge — or the inexpensive way — use a software-only PostScript emulator that runs on your Mac (see Figure 1).

HP's LocalTalk upgrade can be installed in minutes with a screwdriver.

In addition to adding the LocalTalk port, the upgrade leaves the LaserJet with a serial and a parallel port, to either of which you can connect PCs. Unfortunately, you can use only one of these ports at a time, and you must reconfigure the printer each time you switch between ports. HP also sells a PostScript cartridge for the LaserJet.

The Pacific Data Products' Pacific-Talk and Extended Systems' Bridge-Port are external LocalTalk devices that act as logical extensions of the LaserJet — that is, the printer name in the Chooser shows up as BridgePort or as PacificTalk.

Figure 1: LocalTalk/PostScript Setups

Figure 1: Your Mac can print to an HP LaserJet if it has the right connections. In addition to providing the necessary cables and software drivers, you may also want to give the LaserJet fluency in LocalTalk and PostScript. LocalTalk can be added via an external box or with HP's add-in board. You add PostScript by running emulation software on the Mac or by using a PostScript font cartridge in the printer. Various combinations of hardware and software are possible (several of which are shown here), although not all the options can be mixed and matched. For example, HP's LocalTalk upgrade requires a PostScript cartridge in the LaserJet.

Figure 2: MacPrint's Font Mapper creates suitcases of Mac screen fonts based on the fonts in LaserJet font cartridges, giving you WYSIWYG fonts with a QuickDraw printer driver. The "41 Printer fonts" refers to the font cartridge currently selected, the HP PC ProCollection.

The BridgePort also supports PCs, which can be plugged into it simultaneously via its serial port and parallel port. Both of these ports, unlike HP's LocalTalk upgrade, can work at the same time as LocalTalk. In addition to connecting PCs to the LaserJet, the BridgePort gives PCs access to Mac-compatible laser printers on a Local-Talk network. The connection to the printer can be made by either a serial or a parallel connection. (Parallel connections are faster and usually more desirable.)

The PacificTalk is a much simpler device, with one LocalTalk port and one parallel port. It costs $200 more than the BridgePort, but it comes bundled with the PacificPageP•E, Pacific Data Product's PostScript cartridge, so it costs $250 less than the combination of the BridgePort and HP's PostScript cartridge.

The three LocalTalk adapters performed similarly, with the BridgePort edging out the other two. All three models worked without any problems when tested on an internet containing five routers.

PostScript Emulators

Using PostScript cartridges is a much easier and faster solution than running PostScript emulation software on your Mac, but the software alternatives are less expensive. There are three low-cost emulators: Freedom of Press Light, from Custom Applications (see review, February '91, page 93), UltraScript for the Macintosh, from QMS Software

Products (February '91, page 93), and TScript, from TeleTypesetting (August '90, page 62). Note, however, that these packages don't work with HP's LocalTalk upgrade, which requires a PostScript cartridge in order to recognize the LocalTalk port.

The best PostScript emulator on the market is still Freedom of Press, which was the first product of its kind. FOP Light is a slimmed-down version of the full Freedom of Press (which costs five times as much, has more fonts, and supports more printers). The cost of the full version is nearly as much as that of an HP PostScript cartridge, which is easier to deal with and faster and gives you true PostScript. But for those on a tight budget, Freedom of Press Light is a good deal and, combined with Adobe Type Manager, gives you plenty of fonts to work with. At $98, FOP Light has more features than the $195 UltraScript or the $145 TScript.

One-on-One Solutions

If your Mac isn't part of a LocalTalk network, consider a one-printer, one-Mac solution. Although not as convenient as the LocalTalk/PostScript route, the one-on-one methods are more cost-effective if only one Mac is involved.

There are two parts to this type of solution: the physical connection and the software that provides the logical connection. The physical connection is usually through the serial port, but there are some exceptions. The software supplies the fonts and Chooser

drivers used in place of the standard LaserWriter driver.

The most popular of these packages is Insight Development's MacPrint, which comes with a serial cable to transmit from Mac to printer at 19,200 bps. The MacPrint driver operates similarly to Freedom of Press, except that MacPrint uses QuickDraw to describe the characters to be printed. MacPrint supports dozens of font cartridges from HP and third parties as well as the fonts built in to the Laser-Jet. (You cannot use a PostScript cartridge with MacPrint or the other QuickDraw drivers.)

Included in the package is Font Mapper, a utility that creates bit-mapped screen fonts that correspond to LaserJet-cartridge fonts, giving you WYSIWYG text. It supports 63 font cartridges and internal LaserJet fonts, and its matches are quite good. Font Mapper creates font suitcases (see Figure 2) that you can install into your system by using Font/DA Mover, Suitcase II, or MasterJuggler. If you don't use a font created by Font Mapper, MacPrint creates a printer font based on the QuickDraw screen font. Using the MacPrint fonts is faster and yields better quality, however.

The Print dialog box gives you a choice of high, medium, and low output quality, as a dot-matrix-printer driver does. I saw little discernible difference in print quality among the different settings, but the "low" setting is quite a bit faster at printing graphics.

JetLink Express, from GDT Softworks, is a similar product that includes a serial cable and four outline-font families. It doesn't have access to as many fonts as MacPrint does, but it does have some unique features, such as support for outline fonts. Its outline fonts are not PostScript, but they do let you reduce or enlarge font size without loss of quality. JetLink Express can also perform automatic font substitutions. In addition, its printer driver is the first to support Apple's Communications Toolbox, a new tool for supplying a consistent interface for connectivity products (see Bridges,

LaserJet Printers

September '90, page 295).
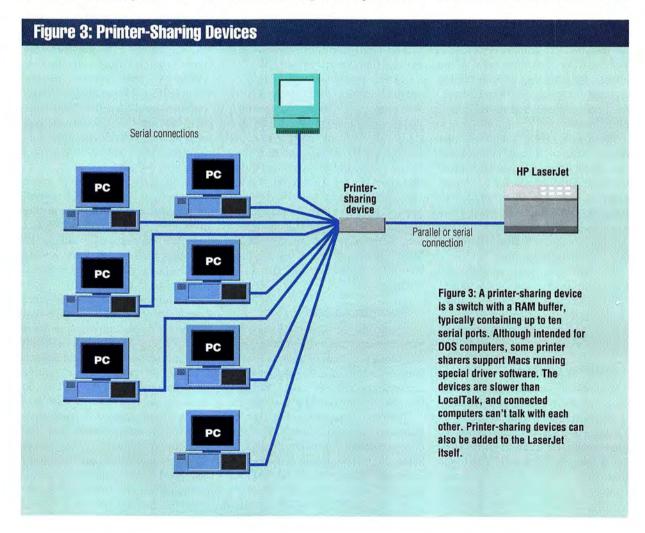
A competing product is the Grappler from Orange Micro, which comes in two versions for the LaserJet. The Grappler LS, like MacPrint and JetLink Express, comes with a serial cable and runs at 19,200 bps. The Grappler LX comes with a powered parallel connection. The similarities to MacPrint and JetLink Express end there, however, because the Grappler's software works on a completely different principle. Whereas MacPrint and JetLink Express install a different Chooser driver for each printer (LaserJet+, II, IID, IIP, and III, among others), the Grappler uses Apple's Image-Writer LQ driver. In fact, the Grappler was originally designed for printing to non-Mac dot-matrix printers such as Epson-compatible printers.

Because the Grappler, MacPrint, and JetLink Express don't use Apple's LaserWriter Chooser driver, you can't use the Mac's Print Monitor spooler, which is part of Apple's LaserWriter driver. Without Print Monitor or another spooler, your Mac is tied up until the printing job is finished. The Grappler compensates for this by supplying a built-in print spooler accessible through the Control Panel. This spooler doesn't work as smoothly as Print Monitor — there is some jumpiness when you're typing during a printing job — but it is better than not having a spooler at all. MacPrint and JetLink Express do not have spoolers, but both are compatible with 5th Generation's SuperLaserSpool, which

you need to buy separately.

The Grappler does have some disadvantages compared with its competitors. Both MacPrint and JetLink Express are faster than either version of the Grappler. MacPrint is better documented than the Grappler and has many more fonts (although you can add fonts to the Grappler with Alphabits, an add-on package of Bitstream fonts).

MacPrint is sometimes bundled with third-party hardware. One of these is the JetWriter, from Extended Systems, which takes a unique approach to connecting a Mac to a LaserJet. The JetWriter, an add-on board specifically for the LaserJet IIP, gives the printer an interface that is a cross between a serial connection and LocalTalk. When

Figure 3: Printer-Sharing Devices

Serial connections

HP LaserJet

Printer-sharing device

Parallel or serial connection

Figure 3: A printer-sharing device is a switch with a RAM buffer, typically containing up to ten serial ports. Although intended for DOS computers, some printer sharers support Macs running special driver software. The devices are slower than LocalTalk, and connected computers can't talk with each other. Printer-sharing devices can also be added to the LaserJet itself.

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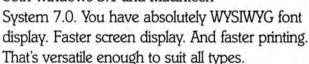
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10X faster than 68000

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The TrueLaser printer is the first printer to ship with TrueImage technology. It includes a bundle of 35 resident TrueType fonts. You also have a printer that's ready for both Windows 3.1 and Macintosh System 7.0. You have absolutely WYSIWYG font display. Faster screen display. And faster printing. That's versatile enough to suit all types.

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In addition to TrueImage, the TrueLaser printer will also work with every member of your Adobe font library. It beautifully publishes Adobe PostScript,®™ Type 1 and Type 3 fonts. It also accepts and prints documents from Macintosh, IBM PC and PS/2 machines via AppleTalk, Centronics and RS-232 interfaces. It's unique autoswitching capability makes the entire process transparent and invisible. It's perfect as both a stand alone printer or a shared network resource. So join the future without leaving the past.

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you configure the LaserJet IIP for the JetWriter, you set the I/O to parallel, but it's not a parallel interface — the JetWriter only fools the LaserJet into thinking it's parallel. You're actually using a high-speed serial interface, faster than any DOS serial interface. In fact, the JetWriter runs at LocalTalk speeds (230,400 bps), because it actually uses part of the LocalTalk protocols. The part of LocalTalk it *doesn't* use, however, is the code that lets you share printers; this is strictly a one-Mac show.

One drawback of using only part of the LocalTalk protocols is that you must run your cable from the Mac's printer port, thereby preventing you from connecting your Mac to a Local-Talk network. (You can, however, still connect to Ethernet or token ring via SCSI or add-in boards.) And unlike HP's LocalTalk card for the LaserJet, which also has serial and parallel ports, the JetWriter card has only the one interface. The JetWriter is faster than MacPrint's serial connection but costs almost $200 more. On the other hand, because it comes bundled with the MacPrint software, it is cheaper than the LocalTalk/PostScript solutions.
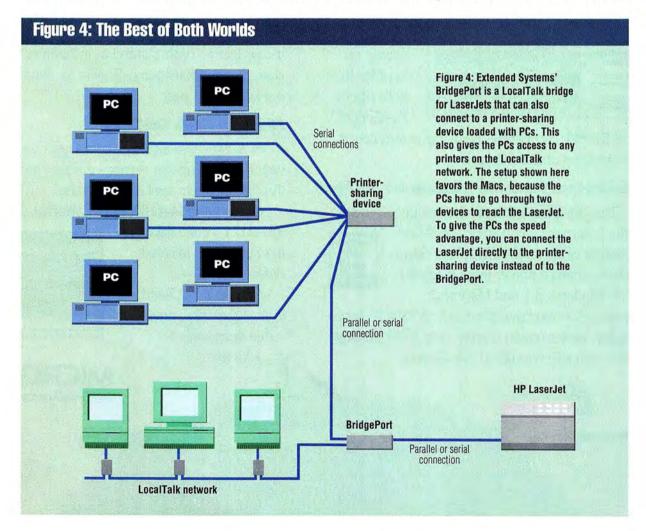
The JetWriter is also cheaper than another one-on-one solution: Post-Script emulation over a serial cable. For $499, Pacific Data sells its PostScript-emulation cartridge on its own, without the PacificTalk LocalTalk bridge it is usually bundled with. You also need the Pacific MacPage Connection Kit ($99), which contains the serial cable and the necessary software.
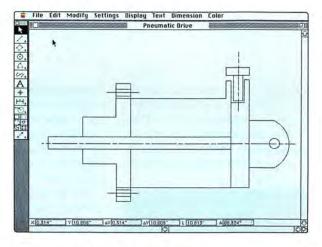
Freedom of Press can also be used over a serial cable, but only if you're not in a hurry. Using a serial connection set at 19,200 bps, Freedom of Press took about six times as long to print as did either MacPrint over the same serial setup or PostScript over LocalTalk.
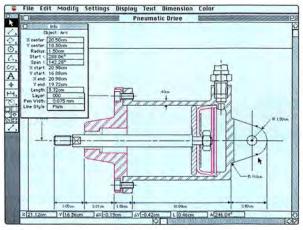
Printer-Sharing Devices

In the DOS market, where networking capabilities are not built in to the CPUs, printer-sharing devices have become fairly popular. These boxes can connect one or more LaserJets to multiple PCs, usually via serial ports. You can add RAM to most of these products for a buffer, which becomes

Figure 4: The Best of Both Worlds

Figure 4: Extended Systems' BridgePort is a LocalTalk bridge for LaserJets that can also connect to a printer-sharing device loaded with PCs. This also gives the PCs access to any printers on the LocalTalk network. The setup shown here favors the Macs, because the PCs have to go through two devices to reach the LaserJet. To give the PCs the speed advantage, you can connect the LaserJet directly to the printer-sharing device instead of to the BridgePort.

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LaserJet Printers

more important as you add PCs. Several of these devices now also support Macs when you add the correct driver software (see Figure 3).

ASP offers a bundle that includes MacPrint with its Maestro printer sharer, but any driver works. The Maestro also supports VAX and HP 3000 computers, in addition to PCs. There are three Maestro models; the top-of-the-line model 1000 has ten serial input ports and two parallel output ports.

You need DOS software and at least one PC to configure several of Maestro's ports beyond 9,600 bps. And you might want to do this, because the serial ports can be set to 115,200 bps. It's a capable unit; unfortunately, it comes with a bare-bones manual.

The ShareSpool, from Extended Systems, does not directly support Macs, but it works very well in combination with the BridgePort. This is a very good solution if you have a lot of PCs and a Macintosh LocalTalk network. The setup shown in Figure 4 is optimized for good Mac performance, but if PCs are emphasized in your office, you can switch the setup around: Connect the ShareSpool directly to the printer, and hang the BridgePort off the ShareSpool.

Although other printer-sharing devices can be used with the BridgePort, the ShareSpool has several things going for it. It has a parallel input port, which speeds up the connection to the BridgePort. The model 2089 can be totally configured by the DIP switches on the back, without using DOS software. A serial port and a parallel port are available for connecting to printers, although the 2089 can connect to only one printer at a time. Other ShareSpool models can connect to two printers.

Several companies package printer-sharing devices as add-in boards to the LaserJet, giving the LaserJet more ports. ASP's ServerJet, which has ten serial ports and 1 megabyte of RAM for buffer memory, was expected at press time to be outdone by a new version that will connect up to 12 computers and have 4 megabytes of memory. Like the Maestro, the ServerJet supports Macs, PCs, VAXes, and HP 3000s.

Pacific Data Products' Pacific Connect LaserJet board is a low-cost solution with one parallel port and four serial ports that can run at speeds of up to 115,200 bps. It supports Macs if you buy Pacific Data Products' driver kit and also supports MacPage PostScript emulation. As with some of the other printer sharers, you must use DOS software to configure the ports.

Figure 5: Sample Performance

Hewlett-Packard LaserJet III Printing Times

Better — Worse

- BridgePort with HP PostScript
- PacificTalk with Pacific PostScript
- HP LocalTalk with HP PostScript
- Grappler FS, serial
- Grappler FX, parallel
- MacPrint, serial
- JetLink Express, serial, outline fonts
- Freedom of Press, serial

0 20 40 60 80 100 120 140 160 180
Seconds

Hewlett-Packard LaserJet IIP Printing Times

Better — Worse

- JetWriter
- MacPrint, serial
- HP LocalTalk, HP PS cartridge

0 20 40 60 80 100 120 140 160 180
Seconds

- ■ Text
- □ Text/graphic

Figure 5: There are many possible combinations of font strategies and connection methods and settings, but here is a representative sample of how the products perform under ideal conditions. The chart shows how long (in seconds) it took to print two test documents: a 200-word text document with multiple styles of a single font and the same document with a bit-mapped graphic added. The BridgePort was the fastest LocalTalk connection, but MacPrint over serial cables did quite well compared with the LocalTalk/PostScript combinations. All serial connections were set at 19,200 bps. JetLink Express, which uses outline fonts, did much better than Freedom of Press, a PostScript emulator, which was the slowest driver of all. The LaserJet IIP, a slower printer than the LaserJet III, was used to test the JetWriter, which runs only on the IIP. The JetWriter is the fastest solution for the IIP because it runs at LocalTalk speeds. It beat HP's LocalTalk because it uses the MacPrint driver, whereas the HP LocalTalk card requires a PostScript cartridge, which adds processing time.

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Output from LaserWriterII NT, 300 dpi.

Output from LaserWriterII NT with Accel-a-writer upgrade, 1200 x 300 dpi, 150 lpi with 26 gray levels

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Works well with others. Accel-a-Writer is fully compatible with Adobe's® PostScript® page description language. It comes with 2MB of memory and expands to hold up to 16MB. What's more, our ISI technology lets you print from PCs and Macs simultaneously, without additional hookups or switch-

ing. All models feature AppleTalk, serial, parallel* and optional SCSI ports for maximum versatility.

Rewards you for trade-ins. Accel-a-Writer comes with a generous trade-in allowance that lets you lower your price even more when you send in the LaserWriter controller it replaces. And installation's simple. It just plugs inside your LaserWriter, with no special tools or service calls needed.

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Centronics® parallel interfaces not available for the original LaserWriter and LaserWriter Plus printers.

Accel-a-Writer ™

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Extended Systems has several add-ins for the LaserJet. The ShareSpool 2094 gives your LaserJet four parallel ports. Like Extended Systems' external ShareSpool boxes, the 2094 does not support Macs directly, but you can plug in a BridgePort to connect a LocalTalk network.

The Bottom Line

Figure 5 summarizes how quickly various configurations printed our test documents. Speed isn't the only consideration; although all the alternatives offer good output and substantial cost savings over buying a new printer, there's a trade-off between flexibility and ease of use on the one hand and how much you're willing to invest in printer add-on hardware and software on the other. One thing is clear: If you want to print to an HP LaserJet from a Mac, the fastest and easiest solution is to add LocalTalk to the LaserJet and pop in a PostScript cartridge, and you've finished — without adding a single byte of software to your Mac.

For sites that have a lot of PCs as well as a Macintosh network, Extended Systems' BridgePort LaserJet-to-LocalTalk bridge ($495) provides the most benefits and versatility for Mac as well as PC users. The BridgePort excels with its abilities to connect to printer-sharing devices and to let PCs share any LocalTalk printer.
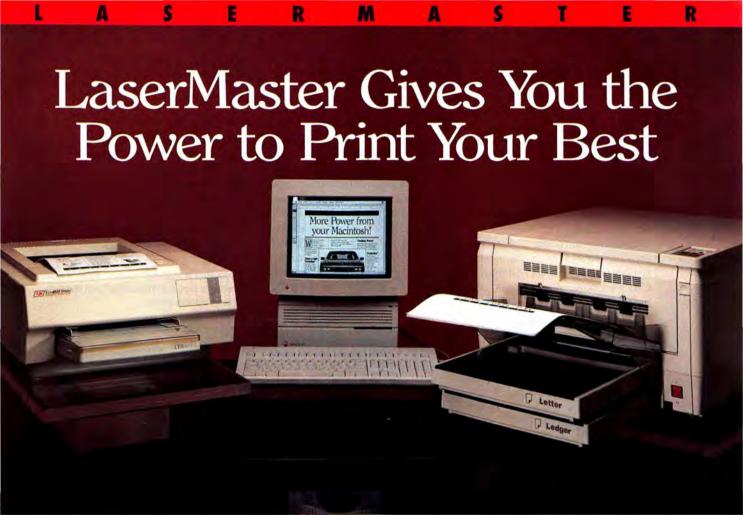
If you have only Macs or if your PCs are on a LocalTalk network, HP's Interface Kit for AppleTalk/HP LaserJet ($275) is cheaper. Like the BridgePort, it works very smoothly with the HP PostScript Cartridge ($695) installed in the LaserJet.

Font snobs will revel in the "real PostScript" of HP's cartridge, but if

Table 1: LocalTalk/PostScript Solutions*

	CAI Freedom of Press ⬥⬥⬥⬥	Extended Systems BridgePort ⬥⬥⬥⬥⬥	Hewlett-Packard Interface Kit for AppleTalk/HP LaserJet ⬥⬥⬥⬥½	Hewlett-Packard Postscript Cartridge ⬥⬥⬥⬥⬥
List price	Full version, $495 FOP Light, $98	$495	$275	$695
Description	software PostScript emulator	external LocalTalk bridge	internal LocalTalk for LaserJet	font cartridge for LaserJet
Comments	Best software emulator. $98 version has more features than other brands.	Easy to set up and use. Can plug in a printer-sharing device.	Easy to set up and use. Requires PostScript cartridge.	True PostScript.
Company	Custom Applications, Inc. 900 Technology Park Dr. Bldg. 8 Billerica, MA 01821 (503) 667-8585	Extended Systems 6123 N. Meeker Ave. Boise, ID 83711 (208) 322-7575	Hewlett-Packard 19319 Pruneridge Ave. Cupertino, CA 95014 (800) 752-0900	Hewlett-Packard 19319 Pruneridge Ave. Cupertino CA 95014 (800) 752-0900

	Pacific Data Products PacificTalk ⬥⬥⬥⬥½	Pacific Data Products PacificPageP•E 4.0 ⬥⬥⬥⬥½	QMS UltraScript ⬥⬥⬥½	TeleTypesetting TScript ⬥⬥⬥
List price	$699	$499	UltraScript, $195 UltraScript Plus, $495	$145
Description	external LocalTalk bridge	PostScript-emulation cartridge for LaserJet	software PostScript emulator	software PostScript emulator
Comments	Includes PacificPageP•E LaserJet cartridge. Easy to set up and use.	Works with Pacific MacPage Connection Kit (serial), $99	Clumsy approach to Type 1 fonts. Good feature set.	Bare-bones interface. Limited features.
Company	Pacific Data Products 9125 Rehco Rd. San Diego, CA 92121 (619) 552-0800	Pacific Data Products 9125 Rehco Rd. San Diego, CA 92121 (619) 552-0800	QMS Software Products P.O. Box 58101 Santa Clara, CA 95052 (800) 635-3997 (408) 986-9400	TeleTypesetting Co. 474 Commonwealth Ave. Boston, MA 02215 (617) 734-9700

*Products are rated here solely with respect to their usefulness in printing to HP LaserJets, so ratings may differ from those appearing in reviews in past issues.

LaserJet Printers

you don't mind "fake" PostScript, Pacific Data Products' PacificTalk ($699) is an even better buy. The cartridge included in the package produces professional-quality fonts, and the LocalTalk bridge for the LaserJet performs admirably.

PostScript cartridges are the easiest and fastest way to go, but for those on a shoestring budget, a good option is CAI's Freedom of Press Light ($98), the most full-featured PostScript

emulator short of the complete Freedom of Press ($495). (If you can afford the complete version, you're better off buying a PostScript cartridge.)

Printer-sharing devices don't allow for growth the way LocalTalk does and are slower; we recommend using them only if you have a lot of PCs.
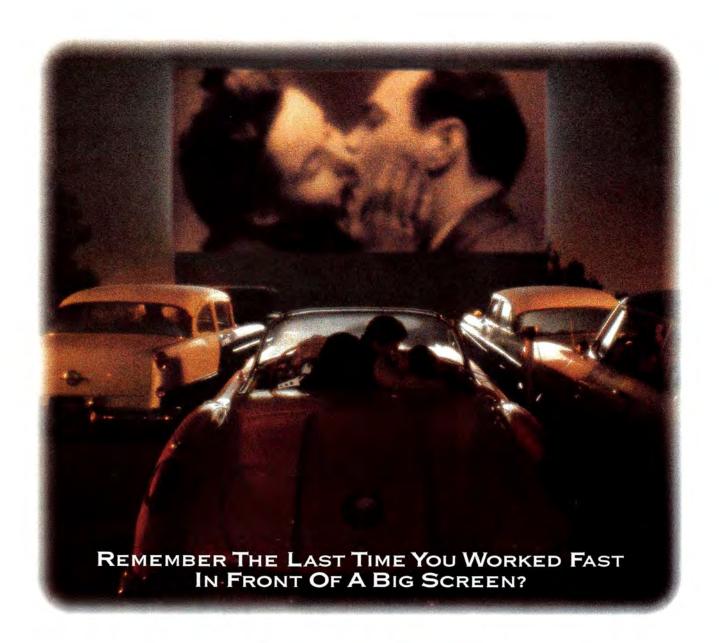
Finally, for those who have only one Mac they want to connect to a single LaserJet and don't need PostScript output, QuickDraw emulators work

fine over a serial cable. Our pick here is JetLink Express ($159) from GDT Softworks, which edges out Insight's MacPrint ($149) thanks to its use of outline fonts. In either case, the trade-off for giving up the PostScript emulation of Freedom of Press is a big increase in output speed. ▨

John Rizzo is *MacUser's* technical editor and the author of more than 100 articles about Mac technology and connectivity.

Table 2: One-on-One Solutions, Non-PostScript*

	Extended Systems JetWriter ♦♦♦♦	GDT Softworks JetLink Express ♦♦♦♦½	Insight MacPrint ♦♦♦♦	Orange Micro Grappler ♦♦♦½
List price	$345	$159	$149	LS (serial), $99 LX (parallel), $199 Alphabits fonts, $79
Description	high-speed serial board for LaserJet IIP (comes with MacPrint drivers)	outline-font drivers, serial cable	QuickDraw drivers, serial cable	QuickDraw drivers, serial or parallel cable
Comments	Runs at LocalTalk speed (230.4 kbps).	Good text manipulation. Supports Comm. Toolbox.	Utility maps screen fonts to cartridge fonts. Fast.	Built-in spooler. Slow.
Company	Extended Systems 6123 N. Meeker Ave. Boise, ID 83711 (208) 322-7575	GDT Softworks, Inc. 4664 Lougheed Hwy. Suite 188 Burnaby, BC V5C 6B7 Canada (800) 663-6222 (604) 291-9121	Insight Development Corp. 2200 Powell St. Suite 500 Emeryville, CA 94608 (415) 652-4115	Orange Micro 1400 N. Lakeview Ave. Anaheim, CA 92807 (714) 779-2772

*Products are rated here solely with respect to their usefulness in printing to HP LaserJets, so ratings may differ from those appearing in reviews in past issues.

Table 3: Printer-Sharing Devices

	ASP Maestro	ASP ServerJet	Extended Systems ShareSpool	Pacific Data Pacific Connect
List price	$695 to $995	$495 to $795	$495 to $1,695	$399 to $499
Description	external to LaserJet	internal in LaserJet	external to LaserJet	internal in LaserJet
Comments	Connects up to 10 Macs, PCs, VAXes, and HP 3000 computers and 2 printers. 1-MB-maximum buffer.	Connects up to 10 computers. 1-MB-maximum buffer.	Connects up to 10 PCs. No DOS software required to configure.	Connects up to 12 Macs, PCs. 1.25-MB-maximum buffer. Lifetime warranty.
Company	ASP Computer Products 1026 W. Maude Ave. Suite 305 Sunnyvale, CA 94086 (800) 445-6190 (408) 746-2965	ASP Computer Products 1026 W. Maude Ave. Suite 305 Sunnyvale, CA 94086 (800) 445-6190 (408) 746-2965	Extended Systems 6123 N. Meeker Ave. Boise, ID 83711 (208) 322-7575	Pacific Data Products 9125 Rehco Rd. San Diego, CA 92121 (619) 552-0800

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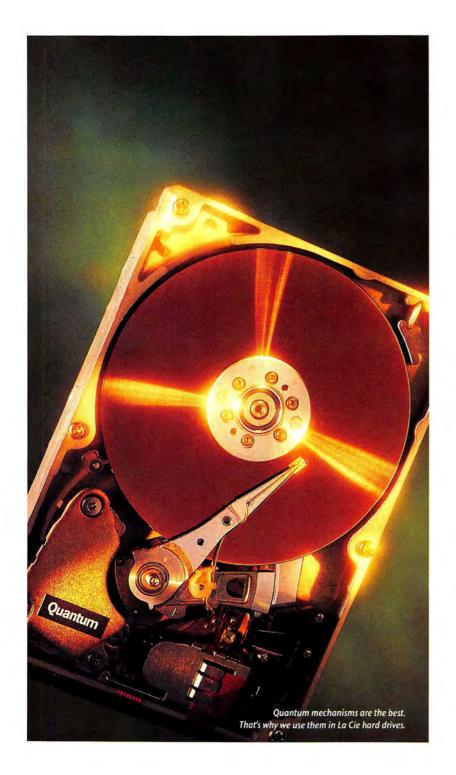
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*Typical application access time using 64KB DisCache®.
**Seagate drive mechanisms also available (capacities from 300MB to 1.2GB).

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Every La Cie drive includes a FREE copy of Silverlining, the #1-rated hard drive management utilities program.

Silverlining drivers can get 30% more speed from a drive than the competition. It works with any true SCSI drive, internal or external. So one program can manage it all. Plus, Silverlining optimizes your data so it's consecutive on your drive, which makes your applications run faster.

And, Silverlining drivers are intelligent. They test the drives' functionality at startup to ensure that everything is working properly. If it's not, it protects you.

MacUser says, "Silverlining is one of the most powerful and useful hard disk utilities you can find—most Apple engineers prefer it to Apple's own."

For even more protection, every La Cie drive includes a FREE copy of Norton Utilities® for the Macintosh. It automatically diagnoses, reports and repairs common and dangerous disk problems. Silverlining and Norton Utilities are regularly priced at $149 each. So, you get software worth almost $300—ABSOLUTELY FREE— when you buy a La Cie drive!

3

A Company You Can Count On.

La Cie is a Plus Development Company (makers of the Hardcard® XL), backed by $400 million in assets. That means you can trust La Cie to provide a constant source of high-quality mechanisms and components. And you can be certain that we'll be around to help you with service and support. For a long, long time.

4

The Most Unusual Warranty in the Business.

La Cie features a RENEWABLE 2-YEAR LIMITED WARRANTY.† If anything goes wrong with your La Cie Quantum drive within two years, we'll repair or replace it within 48 hours—and then renew your warranty for another 2 years. Free of charge!

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†Restrictions apply. Please contact La Cie for complete warranty information.

5

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Hard drives that win design awards? Who says intelligence has to be ugly? The Tsunami and Cirrus hard drives have received prestigious awards from both the industrial design and computer communities.

La Cie drives are designed from the inside out. Designed to be quiet (with a ½ speed fan), lightweight (as light as 2½ lbs.), durable and reliable. Plus, they have an external termination and SCSI address switch, which means you'll never have to open the case for any reason! You don't win awards for these features, but you do win a loyal following.

6

Rave Reviews from Critics and Customers.

Frankly, there's been a lot of talk about La Cie hard drives. Leading Macintosh consumer magazines praise us. Customers write us fan letters. In fact, we're happy to let critics and customers have the last word about La Cie drives. Because they tend to be words like these:

★★★★★ —MacUser

"…the cream of the crop."—Macworld

"Of all the drives tested we recommend La Cie's drive."—MacUser

"This is an excellent drive and Silverlining is great!"—D. Jordan Burbank, CA

La Cie offers internal and external hard drives from 40MB to 1.2 Gigabytes. Choose from the award-winning Tsunami, Cirrus, ZFP Family and Internal drives. Plus, La Cie now offers the Bacster, a hard drive that attaches directly to the back of a Macintosh Plus or SE.

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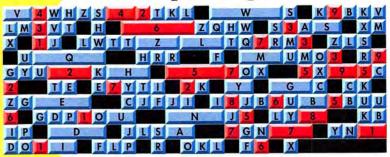
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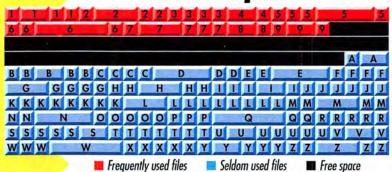
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Even defragmentation software can't help much. Wimpy defraggers just place pieces of individual files adjacent to each other. Defraggers just don't have the intelligence to constantly monitor your file useage. So, any increases in performance are modest and only temporary, disappearing as soon as you use your computer again.

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MacUser
COLOR GEAR

MacUSER LABS

Check out the cover of this magazine. Before it was printed — or even separated — words and images were combined, edited, altered, cropped, viewed from across a room, argued over, and altered and edited all over again. What made it possible were two now-essential tools for desktop color publishing that didn't even exist a few years ago: a true-color display system and a color PostScript printer.

Color is here, and it arrived faster and in more places than anyone expected. This *MacUser* Buyer's Guide details the current colorful state of the Mac both on the monitor screen and on the printed page. Development is moving so fast in this field that last year's award-winning hardware may be this year's also-ran. At the same time, the cost of doing color publishing on the Mac continues to drop, with good color PostScript printers costing only a little more than the original LaserWriter.

These two comprehensive lab reports on true-color display systems and color PostScript printers will help you decide whether it's time to think about adding some color gear to your Mac.

THE PERFECT IMAGE:
True-Color Displays

You can't beat a 24-bit-display system for color desktop publishing, presentations, or artwork. We tested 20, and they all came through with flying colors.

●

**BY
ANDREW EISNER
AND THE
MACUSER LABS
STAFF**

Nothing wows a crowd like a big, sharp color monitor. Whether you're selling a client on an ad campaign or selling products at a trade show, the breathtaking realism of true 24-bit color will make your Mac the center of attention. Until recently, however, the expense of all those crisp pixels made 24-bit color the exclusive domain of professional graphic designers — who had no choice but to wait as their Macs slowly drew complex QuickDraw graphics. But 24-bit color is no longer only for big-budget artists and architects, and QuickDraw acceleration is becoming standard on many video cards. Not just faster and more affordable, these systems now consistently deliver higher-quality color than we found in last year's look at color systems (see "In Living Color," May '90, Buyer's Guide page 32).

If you're considering upgrading an 8-bit-color display system (monitor, NuBus video card, and cables) or if you are about to enter the world of color for the first time, now may be the time to invest in 24-bit color. Once you have, you'll have access to a photo-realistic palette of 16.8 million colors, which the Mac creates by using Apple's 32-bit QuickDraw (the extra 8 bits, called the alpha channel, control effects such as transparency).

PHOTOGRAPHY: WALT DENSON

Figure 1: Performance of True-Color Display Systems

	Overall Performance	Image Quality	Misconvergence
	Worse — Better	Worse — Better	Better — Worse
E-Machines ColorPage T16			
Apple Display 8•24 GC			
Apple Display 8•24			
SuperMac (Sony) 19"			
SuperMac (Hitachi) 21"			
SuperMac (Hitachi) 19"			
E-Machines TX/24			
PCPC II 16" Color			
Seiko Instruments 14" Color			
Mirror ProView/24			
E-Machines T19			
Generation Systems Color 24			
MegaGraphics 2024 16"			
Moniterm Viking C24			
RasterOps 24L			
MegaGraphics 2024 19"			
PCPC II 19" Color			
Sigma Designs ColorMAX 8/24			
Radius DirectColor/24			
Relax Ikegami DM2060			
	0 .25 .50 .75 1.00	0 .50 1.00	0% 50% 100%
	Performance factor	Jury scores	Percent of pixel size

Although no monitor ever achieves true perfection, the E-Machines ColorPage T16 served as the standard against which we compared all the other systems.

These three big SuperMac monitors delivered good color convergence — a difficult feat for large screens.

Relax also sells a 19-inch Trinitron system, but for this report, it submitted a low-cost Ikegami monitor, which scored the lowest in a field of winners.

This is the only monitor tube we tested that's not manufactured by Sony or Hitachi.

Legend: Focus | Geometry | Color | Nuisance

Figure 1: Our expert jury analyzed image quality, and our lab technicians quantitatively tested misconvergence, MTF sharpness, color tracking, and maximum usable brightness.

Overall Performance:

To produce an overall ranking of the 20 display systems, we gave equal weight to subjective and objective scores and calculated the winner. For the second year in a row, the top honors go to the E-Machines ColorPage T16.

Image Quality:

With all the monitors queued up, warmed up, and degaussed, our jury analyzed each screen from a normal viewing distance. Our major concerns were overall focus, geometry (did the monitor distort objects on-screen?), color consistency and "warmth," and lack of nuisance (glare, flicker, jitter, noise, and so on). Eight of the display systems achieved almost-perfect scores.

Misconvergence:
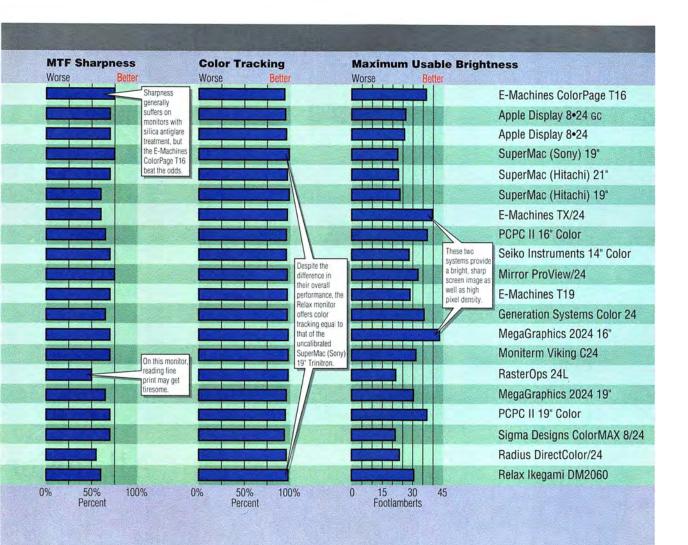
We measured the maximum electron-beam displacement, or *misconvergence,* at the center and corners of each screen. The results are shown here in terms of pixel size — the poorest performer was only a bit more than half a pixel off-center. Misconverged color produces a rainbow effect around objects on-screen. Unlike in the other charts, the longer bars (higher percentages) indicate poorer

---

If the jump to a 24-bit, true-color system would prove too much for your budget or if you want a color display only for normal office applications, consider equipping a Mac LC with Apple's 16-bit VRAM (video RAM) option, for 32,768 potential colors (see the "LC Option" sidebar). At testing time, no 24-bit 68020 PDS (processor-direct slot) cards were available for the NuBus-less LC — and because it uses a Motorola 68020 CPU, the LC can't accept existing 68030 PDS cards designed for the SE/30.

RGB Roundup

For this report, we subjected 20 color display systems to MacUser Labs' full suite of benchmark tests. We tested complete systems, but many cards and monitors are available as individual components. For example, we tested

MTF Sharpness
Worse   Better

Color Tracking
Worse   Better

Maximum Usable Brightness
Worse   Better

Monitors listed (top to bottom):

- E-Machines ColorPage T16
- Apple Display 8•24 GC
- Apple Display 8•24
- SuperMac (Sony) 19"
- SuperMac (Hitachi) 21"
- SuperMac (Hitachi) 19"
- E-Machines TX/24
- PCPC II 16" Color
- Seiko Instruments 14" Color
- Mirror ProView/24
- E-Machines T19
- Generation Systems Color 24
- MegaGraphics 2024 16"
- Moniterm Viking C24
- RasterOps 24L
- MegaGraphics 2024 19"
- PCPC II 19" Color
- Sigma Designs ColorMAX 8/24
- Radius DirectColor/24
- Relax Ikegami DM2060

Callouts:

- "Sharpness generally suffers on monitors with silica antiglare treatment, but the E-Machines ColorPage T16 beat the odds."
- "On this monitor, reading fine print may get tiresome."
- "Despite the difference in their overall performance, the Relax monitor offers color tracking equal to that of the uncalibrated SuperMac (Sony) 19" Trinitron."
- "These two systems provide a bright, sharp screen image as well as high pixel density."

Axis labels:

- MTF Sharpness: 0%, 50%, 100% — Percent
- Color Tracking: 0%, 50%, 100% — Percent
- Maximum Usable Brightness: 0, 15, 30, 45 — Footlamberts

performance. The 13-inch AppleColor Hi-Res RGB Display used with the Macintosh Display Card 8•24 or 8•24 GC showed the advantage that small screens have in convergence testing.

MTF Sharpness:
We compared two on-screen areas — one filled with closely spaced, one-pixel-wide white lines and the other filled with wide, alternating black and white bands. The overall brightness in both areas is nearly equal on a screen with high MTF sharpness, which produces easy-to-read text and fine detail. Generally, MTF scores greater than 50 percent are considered acceptable — only one display system, the RasterOps 24L, failed to exceed this mark.

Color Tracking:
Even the least expensive monitors had good color tracking, providing reliable color at any brightness level. A system with poor color tracking might display a greenish tint in what should be a simple gray square. For accurate color rendition, stick to sharp monitors with excellent color tracking, convergence, and focus, and look into the color-calibration options from Radius or SuperMac.
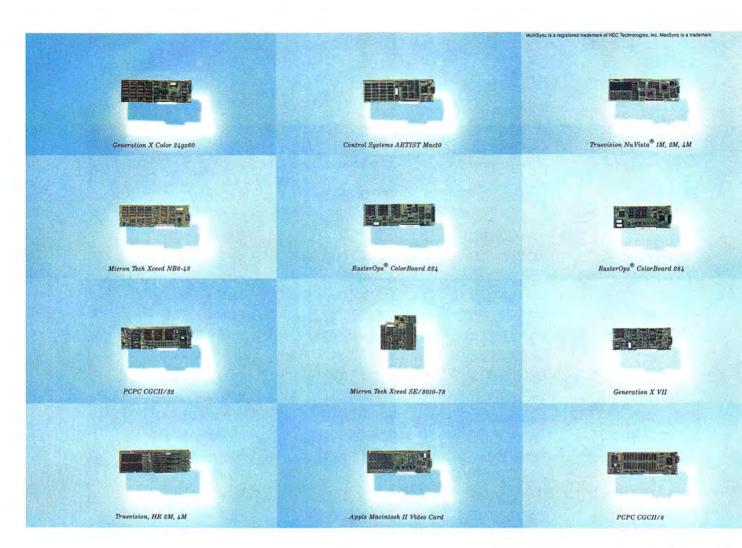
Maximum Usable Brightness:
A bright screen combats glare, is easier to read for extended periods, and allows for high contrast. We determined the maximum brightness possible without unacceptable loss of sharp focus.

the Seiko Instruments 14" Color monitor bundled with the RasterOps 264 card, and many of the systems include the National Semiconductor Mac-Langelo card. We also tested two video cards from Apple: the Macintosh Display Card 8•24 and the accelerated Macintosh Display Card 8•24 GC (both tested with the 13-inch AppleColor Hi-Res RGB Display).

Last year the E-Machines ColorPage T16 with an 8-bit card was one of our top picks; it now looks even better as a 24-bit display. In addition to the T16, we tested three other systems with 16-inch Sony Trinitron tubes: the E-Machines TX/24, the MegaGraphics 2024 16", and the PCPC II 16" Color. The new Ikegami/Sony Trinitron 19-inch and 20-inch monitors were also well represented. Relax Technology

Generation X Color 24gx60

Control Systems ARTIST Mac10

Truevision NuVista® 1M, 2M, 4M

Micron Tech Xceed NB6-48

RasterOps® ColorBoard 224

RasterOps® ColorBoard 264

PCPC CGCII/32

Micron Tech Xceed SE/3010-78

Generation X VII

Truevision, HR 2M, 4M

Apple Macintosh II Video Card

PCPC CGCII/8

All major

Not an unusual claim for a 4-star restaurant. But for a monitor, it's quite a story. With NEC's multiple-frequency technology, our monitors can accept all kinds of video cards for applications ranging from standard desktop software to large-screen graphics design. And your NEC dealer has several different Macintosh-compatible MultiSync® monitors he'd be glad to show you. In fact, he might even take plastic.

MultiSync GS2A *Superior gray-scale monitor, 14" flat-surface screen. Supports the Macintosh II video card and compatibles. Ideal for desktop publishing.*

MacSync™ Series *Designed exclusively for Macintosh II video card and compatibles. Available in both non-glare and new high-contrast 14" screens.*

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E-Machines DoubleColor™

Micron Tech Xceed SE/306-48

RasterOps® ColorBoard 108 +

Relax Tech View II 8-bit 13"

Generation X V/30 X

Relax Tech View II 8-bit 19"

SuperMac ColorCard/24

RasterOps® ColorCard 232

Micron Tech Xceed NB10-78

Generation X V/30 A

SuperMac Spectrum/8 Series III

SuperMac Spectrum/24 Series III

cards accepted.

MultiSync 3D *Supports Macintosh II card and compatibles. Advanced microprocessor digital controls. 14" screen. Perfect for multimedia applications.*

MultiSync 4D *Resolution from standard Macintosh II card, 800 x 600, up to 1024 x 768. Choose your own dpi on a 16" screen. Microprocessor digital controls.*

MultiSync 5D *Resolution from Mac II card and compatibles up to 1280 x 1024 on a 20" screen for graphics design. Microprocessor digital controls.*

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The LC Option

If you need a true-color Mac but can't afford a IIci or one with a larger display system, take a serious look at the Macintosh LC, the lowest-cost color Mac. Although the LC can't support true 24-bit color, Apple's optional $199 VRAM SIMM brings it to 16 bits per pixel — close enough that most users won't miss the extra precision and smoothness that 24-bit color provides. With 16-bit color, three 5-bit channels provide 32,768 colors. The other bit is left for developers to add such niceties as transparency. When combined with the Macintosh 12" RGB Display, the optional VRAM SIMM, 2 megabytes of RAM, and a 40-megabyte hard drive, the LC becomes a complete 16-bit system for a list price of about $3,300 — that's $2,250 less than a 24-bit IIsi system. You could buy two Mac Classics with the money you save!

In our benchmark examination, the new Mac 12" RGB Display performed nearly as well as the 13-inch AppleColor Hi-Res RGB Display in most tests and proved superior in brightness and MTF sharpness. Convergence, however, was not as good as with the more expensive AppleColor. For those who can live with its lower 512-x-384-pixel, 64-dpi resolution, the 12-inch display, when coupled with the Mac LC and the 512K VRAM SIMM, delivers an inexpensive low-end almost-true-color system.
— Jeff Pittelkau

The low-cost Mac LC with the new 12" RGB Display can provide sharp 16-bit color.

---

submitted a 20-inch Ikegami monitor (not the Trinitron model tested last year and still sold by Relax). There were six 19-inch Sony Trinitron systems from E-Machines, Mega-Graphics, Radius, RasterOps, Sigma Designs, and SuperMac. SuperMac also sent us two systems with Hitachi monitors for testing.

Four of the tested systems — the Apple Display 8•24 GC, the SuperMac (Sony) 19", the SuperMac (Hitachi) 19", and the SuperMac (Hitachi) 21" — offer video cards with built-in accelerators. QuickDraw acceleration, now a sometimes-expensive option, should become standard in future 24-bit systems (see the "On the Horizon" sidebar).

Do I Really Need It?

If you're using color in the graphic arts or multimedia, then you should investigate 24-bit display. If you're now limited to 8-bit color, you probably often see "banding" (or "steps") in color images — instead of making smooth transitions, colors jump abruptly from one shade to the next.

If all you do is word processing and spreadsheet work, then stick with monochrome or gray-scale systems; they're cheaper and display a sharper image. And if you do make the move up to 24-bit-color programs, make sure you have the disk storage and RAM to deal with enormous data files (see "Portable Secure Unlimited-Storage Cartridge Drives," February '91, page 206, and "Maximum Movable Megabytes: Erasable Optical Drives," November '90, page 102). Images created in 24-bit color usually require three times the disk space as 8-bit-color images of the same size.

If you work in a fast-paced graphics-production environment and your Mac would benefit from QuickDraw acceleration, then go for a 24-bit system that at least allows this as an upgrade option. As screen size and the number of pixels increase, 24-bit color costs time as well as money (see the "Acceleration" sidebar).

What Will It Cost?
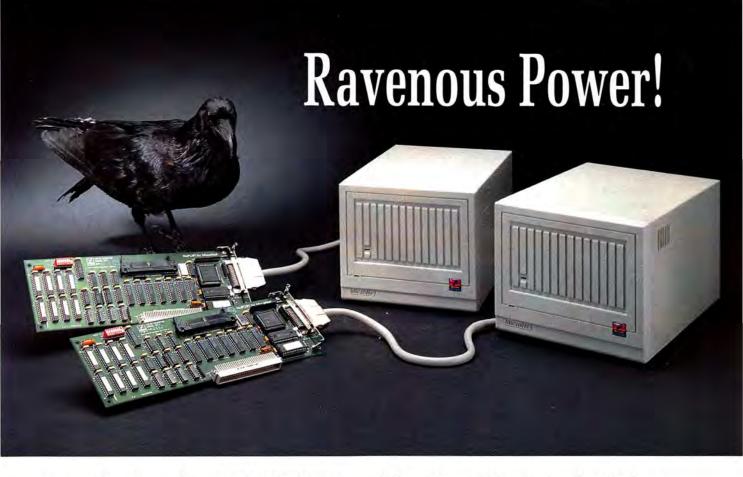
The list price for display systems we tested ranged from $1,644 (for the Seiko Instruments 14" Color) to $9,148 (for the MegaGraphics 2024 19"); street prices were considerably lower (see Table 1). Depending on features and

built-in acceleration, the 24-bit-video card accounts for between 30 and more than 50 percent of the total price of a display system.

All the monitors we tested can display up to 16,777,216 colors. In fact, most monitors capable of displaying 8-bit color can also display 24-bit color and should cost the same; the video card is the only element that raises the price. If you want to upgrade an 8-bit system, you should only have to install appropriate software and a new or upgraded video card in your Mac.

Some card manufacturers (such as SuperMac and Mirror) accept trade-ins or perform reasonably priced upgrades on their older 8-bit cards. As this article goes to press, Apple, Mirror Technologies, and RasterOps offer 8-bit cards as well as do-it-yourself kits for 24-bit upgrades — more companies are sure to follow suit. E-Machines offers a MoreCare option, which allows you to trade in your 8-bit card for its original retail value.

How Quick Can You Draw?

One advantage of color on the Mac is that you can easily change the display's *bit depth* — the number of

Figure A: Macintosh 12" RGB Display Performance

	Worse	Better
Number of pixels		
Maximum usable brightness		
Color tracking		
MTF sharpness		
Convergence		
Focus (subjective)		
Geometry (subjective)		
Color (subjective)		
Nuisance (subjective)		

0 20% 40% 60% 80% 120% 140% 160%
Performance factor

13-inch AppleColor Hi-Res RGB Display
and Macintosh Display Card 8•24

Figure A: Despite having a lower pixel density (64 dpi) and a slightly smaller active screen area than the more expensive AppleColor Hi-Res RGB Display, the new Macintosh 12" RGB Display is very sharp and bright, with excellent color quality.

bits per pixel, which determines the number of displayable colors. If the bit depth is 1, you're limited to black or white (two displayable "colors") but screen updates happen fast. The greater the bit depth, the more processing time is needed to "paint" the screen. Also, the NuBus can transfer only 32 bits of data at a time — thirty-two 1-bit pixels in the same amount of time as four 8-bit pixels or *one* 32-bit pixel (which has 24 bits of color information).

Assuming that your software program and your current project can use different bit depths, you can tip the balance between image quality and speed by using the Monitors cdev (or the shareware Fkey Switcheroo, available on Zmac) to select a shallower bit depth. If 24-bit mode is too slow, downshift to 16 or even 8 bits, do your editing, and then return to 24 bits for a final look. Only the E-Machines ColorPage T16, T19, and TX/24 and the Radius DirectColor/24 allow 16-bit mode — which is a shame, because it's faster than 24-bit mode yet rarely looks noticeably different.

Another advantage of the Mac is that you can use more than one display system simultaneously. If you already

have an unaccelerated 24-bit-video card that supports NuBus block transfer (which lets video data move in big, fast chunks), then an accelerator card that uses this feature — such as Apple's state-of-the-art 8•24 GC — can improve the performance of *both* the monitor attached to the unaccelerated card *and* the monitor driven by the accelerated card. Some accelerators are also capable of acting as a *bus master*, able to take control of NuBus traffic — which also helps accelerate multiple displays. However, our testing showed that on-board acceleration in a video card is best, speeding up screen redraw as much as eightfold over a standard card.

One Size Does Not Fit All

Displays are measured in dpi (dots, or pixels, per inch). Apple designed the Mac around the traditional point measuring system (72 points equal an inch) used in the printing industry. The closer a Mac display's resolution is to 72 dpi, the more closely a supposedly inch-long object will be to an authentic inch on the screen. A screen with a resolution of exactly 72 dpi is often called WYSIWYG — what you see is

what you get. If a monitor's resolution is higher than 72 dpi, it displays more information on the same-sized screen but text appears shrunken and image sharpness may suffer. However, some graphic artists argue that the more closely packed the pixels in a 24-bit-color display, the better for previewing artwork, especially photos, because the pixel grid is less visible.

You can calculate the dpi of a monitor by dividing the number of pixels (measured horizontally) by the horizontal size of the active display area. For example, the E-Machines ColorPage T16 displays 832 pixels in 11.75 inches to get 71.7 dpi (close enough to be true WYSIWYG). However, the E-Machines TX/24 and the MegaGraphics 2024 16" cram 1,024 pixels into the same screen area, producing a very dense 88 dpi.

Trinitron Challenged

Of the 20 display systems we tested, 17 use the superb Trinitron technology in monitors either built by or licensed from Sony. However, this technology is being challenged by another Japanese manufacturer: Hitachi now sells 19- and 21-inch monitors through various American vendors, including Cal-Comp, Radius, and SuperMac.

What makes the Trinitron tubes so good? They offer three major advantages over conventional shadow-mask tubes (which contain very thin, perforated sheet-metal masks to filter electron beams). First, the Trinitron tube's single-gun, single-lens technology keeps the three electron beams more perfectly aligned within the display tube. Second, a Trinitron tube uses an aperture grille (a flat array of fine, vertically aligned metal wires) that lets more of the electrons strike the screen's interior phosphor coating than does a shadow mask — creating a brighter picture. An aperture grille is also more resistant to doming — distortion caused by heat that results in a blotchy discoloration of the screen image — than is a thicker shadow mask. Third, a Trinitron tube's cylindrical screen reflects less ambient light than does the

Ironically, the difference bet
and the second best ha

ColorPoint *PS*

$6999

Yes, the ColorPoint offers top-notch color. It also offers superior performance in other respects. But the best news of all is the price—$6,999 for the A (letter) size and $9,999 for the B (tabloid) size.

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ColorPoint is PANTONE* certified. So it simulates PANTONE colors and greatly simplifies color proofing.

ColorPoint's unique roll-feed, double-cut technology gives you the biggest image size of any comparable printer. Delivered on perfectly trimmed and finished pages. And this same technology also assures you perfect registration every time.

ween the best color printer
s little to do with color.

ColorPoint is 100% Adobe PostScript language compatible, thanks to the PhoenixPage interpreter. From graphics to fonts, what you get out of the printer is faithful to what you sent it. What's more, PhoenixPage's advanced screening techniques produce smoother shading and less grainy images. ColorPoint also supports industry standard downloadable typefaces such as Adobe Type 1 fonts— including hints.

Five communication ports— parallel, serial, AppleTalk and two SCSI ports—make it easy to connect ColorPoint to Mac, PC, workstation or larger computers. And ColorPoint is easy to share because it will automatically poll the ports, so you don't have to tell it what interface you're using.

ColorPoint includes an Intel® 80960 embedded RISC-based processor that speeds up image-processing time. So you not only get superior 300 dpi quality, you get it as much as 60% faster.

Obviously, color is critical. It's why you're looking at color printers in the first place. So rest assured, ColorPoint PS offers the best color around.

But before you decide on a color printer purely on the basis of color, you should take a look at ColorPoint's other advantages as well. The speed. The PostScript compatibility. The perfect registration. The ability to print a full page, both in A and B sizes—even in transparency form.

Then take a look at the price.

We think you'll find that deciding between ColorPoint and second best is a black and white decision.

To find out more, give us a call at 1-800-873-4561 and ask for department SI-51.

SII
Seiko Instruments

On the Horizon

As color becomes more popular, you can expect to see price reductions on 24-bit-video boards, color monitors, QuickDraw accelerators, and multipurpose boards (combining acceleration and video goodies). Market leaders such as E-Machines, Radius, RasterOps, and SuperMac share Apple's new let's-make-a-deal disposition.

At press time, RasterOps was introducing its new 24si board, combining built-in QuickDraw acceleration, NuBus block transfer, and bus-master operation, plus NTSC/PAL genlock timing for video production. The board has a low power requirement, which conforms to the Mac IIsi. The new 24-bit RasterOps 24STV board incorporates full-motion video, overlay, and capture of NTSC/PAL/SECAM input in a resizable window; optional daughterboards provide acceleration and video compression/decompression. RasterOps, 2500 Walsh Avenue, Santa Clara, CA 95051; (408) 562-4200.

E-Machines is releasing two 24-bit Trinitron systems: the 16-inch TXsi and 19-inch T19si, both with boards adapted for the low-power Mac IIsi. But the hot news from E-Machines will be the ColorPage T16/XL24 system (less than $4,000) with built-in 24-bit acceleration and hardware-based pan and zoom. E-Machines earned a perfect five mice for the ColorPage T16 system in this report — the accelerated T16/XL24 may be an improvement on perfection. E-Machines, Inc., 9305 S.W. Gemini Drive, Beaverton, OR 97005; (800) 344-7274 or (503) 646-6699.

SuperMac has started shipping its 19″ Dual-Mode Trinitron Display, which allows you to switch between 1,152 x 870 pixels (two full pages) and a WYSIWYG 1,024 x 768. SuperMac is standardizing on European-standard EBU phosphors (6,500 degrees Kelvin color temperature) on its 19-inch and 21-inch Hitachi monitors. These phosphors produce richer reds and — if accepted as American standards — will advance the cause of international monitor-color accuracy. SuperMac Technology, 485 Potrero Avenue, Sunnyvale, CA 94086; (408) 245-2202.

Radius will offer its DirectColor/24 board with a new Color Display/21, a 21-inch Hitachi monitor also using phosphors with a color temperature of 6,500 degrees Kelvin. Radius, Inc., 1710 Fortune Drive, San Jose, CA 95131; (800) 227-2795 or (408) 434-1010.

In addition, CalComp will add acceleration to its Hitachi 21-inch display system. CalComp, Inc., 2411 W. La Palma Avenue, Anaheim, CA 92803; (800) 458-5888 or (714) 821-2000.

— Andrew Eisner and Bruce Mewhinney

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usual spherical display.

Hitachi's shadow-mask tubes now rival Trinitron quality in sharpness, brightness, and color saturation. Hitachi has developed a special shadow mask made of the metal alloy Invar (nickel, iron, and manganese), which is highly resistant to doming. The two SuperMac Hitachi monitors were high on our jury's list of favorites and offer sharp pictures with good color.

How We Tested

MacUser Labs has tested hundreds of display systems. Not only do we employ sophisticated instruments to rate them objectively but we also have a unique advantage over average consumers: Our experts get to look at all the systems in one room, with the same lighting and the same experienced eyeballs. This time around, *all* the tested systems looked good; even the "worst" performer, the Relax Ikegami DM2060, earned a four-mouse rating, because of image quality and low price.

Before we tested each display, we degaussed it to eliminate magnetic interference. We then oriented each monitor along the east/west axis — when tuning display tubes before shipment, monitor manufacturers do the same to protect against screen-image

distortion caused by the earth's magnetic field. However, none of the tested monitors seemed particularly sensitive to this subtle force.

After each display had warmed up, we measured its *active area* — the portion of the screen that contains the actual image. Although manufacturers define screen size as the diagonal measurement of the tube's entire visible front surface, as framed by the plastic-case bezel, the active area is usually smaller and rarely includes the screen's troublesome perimeter — where accurate focus and color convergence are difficult to achieve.

Brightness Versus Focus

An eternal conflict in monitor design is between screen brightness and focus. The more you turn up the brightness, the more intense the electron beams that scan across the screen's phosphor. The more intense the beams, the less precise their focus.

We used a Minolta TV Analyzer to measure maximum usable screen brightness (see Figure 1). To their credit, all the displays we tested were still in good focus at an acceptable brightness. Some vendors let you crank the brightness way up so that when the screen's phosphors age and become

less responsive, you can energize them to maintain normal luminance. But whatever their age, phosphors deteriorate much more rapidly if brightness is kept too high (or if a screen-saver utility doesn't always blank out the screen when the monitor is left idle).
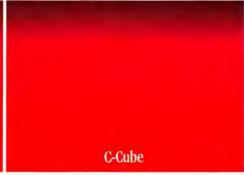
External controls are often provided for monitor brightness and contrast, vertical and horizontal convergence, screen-image position and size, and degaussing. Buying a monitor with all or most of these controls lets you fine-tune the screen image safely, even after the monitor has accumulated some mileage. The interior electrical components of computer monitors (even after power has been shut off) retain lethal electrical charges. Leave internal tinkering to the experts!

Sharpness and Glare

MacUser Labs quantifies MTF (modulation-transfer function) — an objective measure of monitor sharpness — by using a custom-built CCD (charge-coupled device) array to compare the brightness of a series of wide white bands with that of a series of thin (one-pixel-wide) white lines. A sharp monitor delivers the same overall brightness in the area with wide bands as in the area with narrow lines. A

screen that's not so sharp lets the pattern of narrow white and black lines merge slightly, almost becoming a soft-gray area. The higher the MTF numbers, the better the display's ability to distinguish fine detail. Maintaining sharpness is much easier for a low-resolution monitor than for a tube that's forced to squeeze pixels into a limited active screen area. All the display systems we tested delivered good MTF results, with the razor-sharp standouts being the E-Machines ColorPage T16,

the Mirror ProView/24, and the SuperMac (Sony) 19".

Another trade-off in monitor design is between glare protection and sharpness. Anything you put onto the face of the tube to reduce glare allows less light to be transmitted and may lower sharpness. If you turn the brightness up to compensate, the image will lose its sharp focus. The best — and most expensive — antiglare treatment comes from OCLI (Optical Coating Laboratories, Inc.), with some close

competition provided by Asahi Glass' antireflection treatment. The distinctive appearance of OCLI's treatment, apart from a nearly complete absence of screen reflections, includes dramatically enhanced fingerprints (a soft, clean, lint-free cloth and distilled water eliminates these).

The silica-coating antiglare treatment used on two of the E-Machines monitors is surprisingly good. Silica is less costly than OCLI's coating. It works by simply diffusing reflected
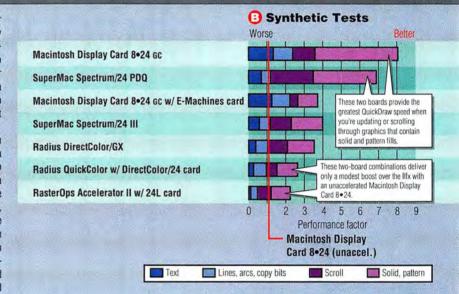
Acceleration

Without a QuickDraw accelerator, your Mac's CPU has to manage both the display screen and the execution of all your keyboard and mouse commands — not to mention all the processing needs of your application. In these slow circumstances, a 24-bit-display board merely stores video data and translates it into the signals that light up your screen.

If, however, the video board has built-in QuickDraw acceleration or works with a separate accelerator board, then it can help whenever an application sends the Mac a QuickDraw call. Instead of waiting for the CPU to send a finished 24-bit-color image, the accelerated video board gets just a terse description (via NuBus) of how the screen should be updated. The accelerator then zips through the 24-bit dirty work of recalculating color pixels. Some accelerated boards (such as the Macintosh Display Card 8•24 GC) also have bus-master capability — taking control of their own or other boards' NuBus traffic during the transfer of video data.

Using a standard window of 640 x 480 pixels, we performed our testing of QuickDraw acceleration on a Mac IIfx — all the accelerators had to work hard just to stay ahead of this fast platform. The unaccelerated Macintosh Display Card 8•24 served as our baseline. Synthetic tests analyzed specific QuickDraw calls (see Figure B), and real-world tests compared common applications (see Figure C).

With the plain Macintosh Display Card 8•24, the 40-megahertz 68030 CPU on the Mac IIfx can keep up with the RasterOps Accelerator II (which handles only some QuickDraw calls). By the time you read this, RasterOps will have introduced the 24si, an

B Synthetic Tests

Worse — Better

- Macintosh Display Card 8•24 GC
- SuperMac Spectrum/24 PDQ
- Macintosh Display Card 8•24 GC w/ E-Machines card
- SuperMac Spectrum/24 III
- Radius DirectColor/GX
- Radius QuickColor w/ DirectColor/24 card
- RasterOps Accelerator II w/ 24L card

These two boards provide the greatest QuickDraw speed when you're updating or scrolling through graphics that contain solid and pattern fills.

These two-board combinations deliver only a modest boost over the IIfx with an unaccelerated Macintosh Display Card 8•24.

0 2 3 4 5 6 7 8 9
Performance factor

Macintosh Display Card 8•24 (unaccel.)

☐ Text   ☐ Lines, arcs, copy bits   ■ Scroll   ■ Solid, pattern

Table A: Features of Accelerators

	Apple Macintosh Display Card 8•24 GC	Apple Macintosh Display Card 8•24 GC with E-Machines Video Card
List price	$1,999	$1,999 + $2,995
Street price	$1,410	$1,410 + $2,200
NuBus slots required	1	2
Maximum power draw, watts	20 W	20 + 9.5 W
RAM on color board	2 MB	2 MB (E-Machines)
RAM SIMM slots	2	0 (E-Machines)
GWorld support	yes	yes (Apple)
NuBus block transfer	yes	yes
Large monitors, 24-bit	via other boards	16-, 19-inch
Bus master	yes	yes (Apple)

light and usually reduces a screen's apparent sharpness — which becomes a problem for high-resolution monitors. To minimize glare from any monitor screen, orient the display so that it doesn't face fluorescent lights or bright windows.

Convergence and Color Tracking

The hues generated by any color monitor come from rows of fine dots (or thin lines) of internal phosphor coating — actually three different phosphor blends that separately create red, green, and blue. These dots are repeatedly excited by three identical colorless beams of electrons. If these beams stray from their intended paths across the phosphor coating, you get *misconvergence* — a rainbow outline around on-screen objects.

If a monitor has external convergence controls or if you have access to a skilled technician, then misconvergence won't be a problem — one reason why it pays to buy from a reputable dealer. Nearly all the monitors we tested had acceptable misconvergence levels, but the Relax Ikegami DM2060 and the PCPC II 19" Color could stand improvement.

Color tracking is a measure of how well all three electron beams deliver exactly the same intensity on-screen (see the "Color Tracking and Gray Linearity" sidebar). Furthermore, if a monitor always displays gray objects in the correct shade between black and white, the monitor has perfect *gray*

C Real-World Tests

Worse — Better

Programs such as Canvas benefit from the Mac Display Card 8•24 GC by itself or with another board.

Although they might help an older Mac II, here the RasterOps cards can't beat a Mac IIfx.

0   1   2
Performance factor

Macintosh Display Card 8•24 (unaccel.)

■ Studio/32   ■ Photoshop   ■ Canvas
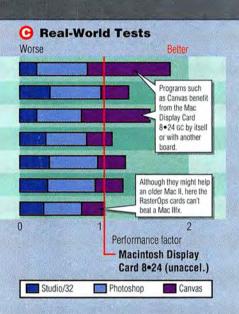
Figure B: On a fast Mac IIfx with 8 megabytes of RAM, any QuickDraw acceleration must be substantial just to beat the IIfx itself. Our speed tests included precise measurement of isolated QuickDraw functions: text, lines, arcs, copy bits, scroll, solid, and pattern. Potential overall acceleration ranged from a low of 120 percent to a high of 700 percent (the Macintosh Display Card 8•24 GC by itself).

Figure C: In actual use, a QuickDraw accelerator is only one of several factors governing a Mac display's speed. We tested each one- or two-board configuration with the bit-map programs Studio/32 and Photoshop and then with the drawing program Canvas (which uses QuickDraw frequently). Actual acceleration varies, depending on the application.

accelerated video board that may rival other single-board products from Apple, Radius, and SuperMac.

If you have a Macintosh II, consider Apple's IIfx upgrade (which earned five mice in our August '90 lab report on accelerators, "Chasing the IIfx: Accelerators," page 84) instead of the slower QuickDraw accelerators. Overall, the Macintosh Display Card 8•24 GC is the fastest — and the best value if you already have an unaccelerated 24-bit-video board for a color display. The SuperMac Spectrum/24 PDQ is the way to go if you need fast 24-bit performance and will be buying a complete large-monitor system. Be sure to match the specific needs of your favorite programs to an accelerator with the appropriate features and available memory.

— Steve Smith

	RasterOps Accelerator II with 24L Video Card	Radius QuickColor with DirectColor/24 Video Card	Radius DirectColor/GX	SuperMac Spectrum/24 III	SuperMac Spectrum/24 PDQ
	$495 + $3,995	$595 + $3,595	$1,095	$2,999	$3,999
	$375 + $2,756	$446 + $2,444	$760	$1,949	$2,679
	2	2	1	1	1
	10 + 7.5 W	8.5 + 20 W	10 W	19 W	17 W
	3 MB	3 MB	1 MB	3 MB	3 MB
	4 (24L)	0 (DirectColor/24)	0	0	0
	yes	no	no	no	no
	yes	yes	yes	no	no
	16-, 19-inch	19-, 21-inch	none	19-inch	19-, 21-inch
	yes	no	no	no	no

linearity as well as perfect color tracking. We measured color tracking and gray linearity with our Minolta TV Analyzer, looking for any differences between measured red, green, and blue intensity on-screen versus what the Mac intended. All the monitors showed good color tracking.

Nuisance Notes

Video cards may look similar, but different engineering approaches can result in differences in bandwidth, stability, and versatility. We evaluated monitors for nuisances associated with card design — such as flicker, jitter, and noise. We're happy to report that none of the systems displayed any nuisance worth noting.

Flicker, which is most perceptible in peripheral vision and is thus a problem with large-screen monitors, was almost nonexistent on the displays we tested. All the cards, except the card provided with the PCPC II 19" Color, had a vertical-scan (refresh) rate greater than 65 hertz, and most have settled on the 75-hertz standard — where flicker is nearly imperceptible.

Software

Radius created some of the first screen-utility software and continues to sell what many users consider the most-versatile software on the market. However, other vendors now offer software with similar goodies: tear-off or expanded menus, enlarged cursors, screen savers, and *panning* (the entire screen acts like a sliding window over an oversized "virtual screen") and *zooming* (enlargement/reduction). The extra memory available on video cards means that some systems let you create amazingly large virtual screens — if you're not in 24-bit-color mode. To provide similar functionality, PCPC bundles Berkeley Systems' Stepping Out II software with its systems, but this software approach is not as fast or

Feature-Table Criteria

List price (system) — The vendor's suggested prices for a complete system (monitor, NuBus board, cables, software), for the monitor only, and for the board only.

Street price (system) — The complete system price at dealers surveyed across the U.S. in early February 1991 or through mail order.

Tube type, phosphor — The monitor tube's OEM and the phosphor coating selected for the screen.

Overall/active screen size — The distance from one corner to the opposite corner on the exposed glass face of the monitor (overall) and the same distance for the actual screen image (active).

Active screen area — The width and height of the actual screen image.

Screen dimensions — The number of dots (pixels) displayed on the screen, counting horizontally and vertically.

Screen resolution — The number of pixels per inch, measured horizontally.

Color modes — The number of potential different screen colors available at different bit depths.

Vert.-scan rate — Also called the refresh rate. How fast, in cycles per second (hertz), the screen is redrawn from top to bottom; 65 hertz is considered sufficient to eliminate flicker.

Horiz.-scan rate — How many lines of pixels can be written on the screen per second, in thousands.

Bandwidth — A factor governing the speed with which monitors can switch electron beams on and off. Monitors with high pixel density need high bandwidth to maintain sharpness.

Power consumption — The separate electrical-power requirements (in watts) of the monitor and the video board.

Antiglare treatment — A coating or transparent panel on the monitor screen designed to eliminate or diffuse reflected light.

Controls — Monitors can have external dials or buttons to adjust screen brightness, contrast, vertical and horizontal position and size of the image, degaussing, and vertical and horizontal convergence.

Case (W x H x D, in.) — In inches, the outside width, height, and depth of the monitor's plastic shell.

Software — 24-bit systems often come with special hardware capabilities or bundled software.
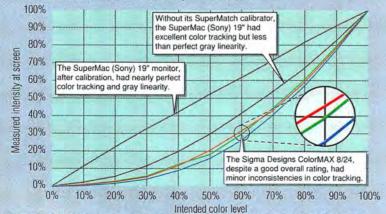
NuBus block transfer — To speed up monitor screen updates, some video and accelerator boards can transfer QuickDraw information in large blocks.

Color Tracking and Gray Linearity

Color tracking is a measure of the *equal strength* of each of the three colors that make up a monitor's image — red, green, and blue (RGB). Gray linearity is a measure of the *equal increase* of these colors as color density increases. Perfect RGB color tracking and gray linearity is shown by the straight line, plotted from lower left to upper right, that represents the color tracking on the SuperMac (Sony) 19", after gamma correction and verification with its optional SuperMatch calibrator. Good color tracking but imperfect gray linearity (a common situation) is seen in the uncorrected SuperMac (Sony) 19", represented by the single curved line directly below the SuperMatch-adjusted plot.
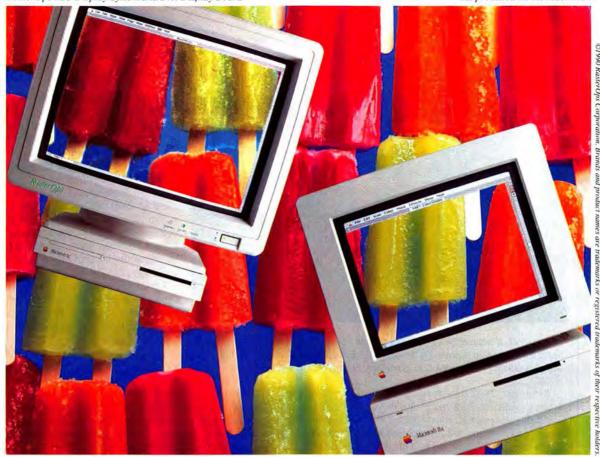
A monitor with imperfect gray linearity as well as imperfect color tracking (represented by the separate red, green, and blue lines at the bottom of the chart, obtained from tests on a Sigma Designs ColorMAX 8/24) suffers from color imbalance and unreliable contrast.

Without its SuperMatch calibrator, the SuperMac (Sony) 19" had excellent color tracking but less than perfect gray linearity.

The SuperMac (Sony) 19" monitor, after calibration, had nearly perfect color tracking and gray linearity.

The Sigma Designs ColorMAX 8/24, despite a good overall rating, had minor inconsistencies in color tracking.

Figure D: Our color-tracking test compared intended and measured color brightness.

The Bottom Line

Professional, affordable 24-bit color is available from these winners (clockwise from upper left): the Seiko Instruments 14" Color, the E-Machines ColorPage T16, the SuperMac (Sony) 19", and the Macintosh Display Card 8•24 GC and 8•24.

especially the **E-Machines ColorPage T16** ($5,190) — our overall pick. It provides professional 24-bit quality at an attractive price. The **E-Machines TX/24** ($5,190) was also of superior quality, despite its non-WYSIWYG high dot density. Other good 16-inch Trinitrons come from PCPC and MegaGraphics.

For the budget-minded, the **Seiko Instruments 14" Color** system ($1,644) offers great performance at very affordable street prices; we only wish that its video board supported 16-bit color and NuBus block transfer. Either the **Macintosh Display Card 8•24** or the **Macintosh Display Card 8•24** GC (accelerated) board is a great buy with Apple's small but razor-sharp 13-inch AppleColor Hi-Res RGB Display (system list $1,798 and $2,998, respectively). The 8•24 GC board is by far the fastest video board we tested.

We thought the **Mirror ProView/24** ($3,997), a 19-inch Ikegami Trinitron with excellent software, was a real bargain. Another system with

A true-color, 24-bit-color display system should provide a crisp, accurate rendering of scanned photos or Mac-generated artwork. This basic requirement is certainly met by the 20 systems we tested: Among the 17 Trinitron- and 2 Hitachi-tube monitors as well as the 1 with the Ikegami shadow-mask tube (from Relax), there isn't a bad display package in the bunch.

We're the most impressed by all the systems from E-Machines,

matching quality and street price was the sharp **SuperMac (Sony) 19"** ($7,199). For high-end graphics, you should take a look at the **SuperMac (Hitachi) 21"** ($8,399). A top-quality monitor, acceleration, and the optional calibration hardware/software make this a very desirable package. SuperMac's just-released 19" Dual-Mode Trinitron Display (see the "On the Horizon" sidebar) should also appeal to graphics pros.

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smooth as having hardware-based virtual screens. The QuickDraw GWorld environment, implemented only on the Macintosh Display Card 8•24 GC and the RasterOps Accelerator II, allows huge, fast virtual screens but demands substantial memory on the accelerator card.

With its ProView/24 system, Mirror Technologies bundles Desktop Designer Pro, which allows customizable pop-up menus; a screen saver; screen-image capture; enlarged cursor and menus; and a Stroke function, which automatically pops up a preselected menu in response to a preprogrammed mouse action.

If you will be doing graphics work that requires extremely accurate color display, take the time to research the calibration and gamma-correction options available from different system vendors (see "Color Calibration" and "In Living Color," May '90, Buyer's

Guide pages 15 and 32, respectively, and "True Colors," March '90, page 233).

Who's the Fairest of Them All?

As much as we like to pick out only the best and leave the rest, we liked *all* the display systems. Our general impression is that buyers can't go wrong with any of these products — although several are especially good for specific tasks. Dividing them roughly into groups, first are the small 13- and 14-inch Trinitron monitors, which cost less than $2,000, including a 24-bit card. Next come the 16-inch Trinitrons, which cost you another grand or two; these offer a little more usable screen area (and if you can live with a compressed dot density, a lot more information on-screen). Then come the excellent 19- and 20-inch Trinitrons from Sony or Ikegami. The attractively priced Relax Ikegami DM2060
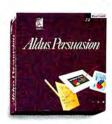
20" monitor scored lowest, but that's in a field of winners. Relax also sells an Ikegami/Sony 19" Trinitron.

If you still demand the original 19" Sony Trinitron, you'll find good ones (see the "Bottom Line" sidebar). However, for serious graphic artists, we also suggest a look at the new 19- and 21-inch Hitachi monitors sold by SuperMac (and soon by Radius and others). If your budget allows, consider either the Radius PrecisionColor or the SuperMac SuperMatch calibration systems and be prepared to spend the extra bucks for an accelerated video card. A fast state-of-the-art color display system may cost several thousand dollars, but you'll end up with something that's easy on your eyes, accurate, and highly productive.

Andrew Eisner, director of MacUser Labs, occasionally suffers from misconvergence but has never been known to flicker.

Table 1: Features of Color Display Systems

	Apple Display 8•24	Apple Display 8•24 GC	E-Machines ColorPage T16	E-Machines T19	E-Machines TX/24
	♦♦♦♦½	♦♦♦♦½	♦♦♦♦♦	♦♦♦♦½	♦♦♦♦½
List price (system)	$1,798	$2,998	$5,190	$7,390	$5,190
Monitor only	$999 (AppleColor)	$999 (AppleColor)	$1,995	$4,195	$1,995
Board only (NuBus)	$799	$1,999	$3,195	$3,195	$3,195
Street price (system)	$1,448	$2,098	$4,150	$5,400	$4,150
Pros	High quality. Sharp. Affordable.	Highest QuickDraw speed. Versatile.	Nearly perfect color. Sharp focus. Great value.	Sharp screen image. Good 39-page manual.	High resolution. Bright. Good manual.
Cons	Small screen. No glare protection.	Small screen. No glare protection.	No OCLI glare protection.	Slight streaking at bottom of active area.	Not WYSIWYG.
Monitor specifications					
Tube type, phosphor	Sony Trinitron, P22	Sony Trinitron, P22	Sony Trinitron, P22	Sony Trinitron, P22	Sony Trinitron, P22
Overall/active screen	13-/11.5-in. diag.	13-/11.5-in. diag.	16-/14.5-in. diag.	19-/17.25-in. diag.	16-/15-in. diag.
Active screen area	9.5 x 7 in.	9.5 x 7 in.	11.75 x 8.75 in.	13.5 x 10.75 in.	11.75 x 9.25 in.
Screen dimensions	640 x 480 pixels	640 x 480 pixels	832 x 624 pixels	1,024 x 808 pixels	1,024 x 808 pixels
Screen resolution	69 dpi	69 dpi	72 dpi	76 dpi	87 dpi
Color modes	2/4/16/256/mill.	2/4/16/256/mill.	2/4/16/256/thou./mill.	2/4/16/256/thou./mill.	2/4/16/256/thou./mill.
Vert.-scan rate	66.7 Hz	66.7 Hz	66.9 Hz	71.3 Hz	72 Hz
Horiz.-scan rate	35 kHz	35 kHz	44.9 kHz	60.2 kHz	60 kHz
Bandwidth	23 MHz	23 MHz	100 MHz	100 MHz	100 MHz
Power consumption	160 W; board, 7 W	160 W; board, 20 W	253 W; board, 9.5 W	286 W; board, 9.5 W	264 W; board, 9.5 W
Antiglare treatment	none	none	silica coating	OCLI	silica coating
Controls					
Brightness/contrast	side/side	side/side	internal/front	internal/front	internal/front
Vert. position/size	rear/rear	rear/rear	front/internal	front/internal	front/internal
Horiz. position/size	rear/rear	rear/rear	internal/internal	internal/internal	internal/internal
Degaussing	rear button	rear button	auto at power-up	auto at power-up	auto at power-up
Vert./horiz. convergence	rear/rear	rear/rear	front/front	front/front	front/front
Other					
Case (W x H x D, in.)	13.75 x 11.75 x 15.75	13.75 x 11.75 x 15.75	16 x 15 x 18.75	18.75 x 18.75 x 21	16 x 15 x 18.75
Weight	34 lb	34 lb	59.4 lb	86 lb	60 lb
Tilt/swivel stand	optional	optional	yes	yes	yes
Software	gamma correction	gamma correction, QuickDraw acceleration	brightness/contrast adjust, screen dimmer, big menus	brightness/contrast adjust, screen dimmer, big menus	brightness/contrast adjust, screen dimmer, big menus
NuBus block transfer	yes	yes	yes	yes	yes
Warranty	1 year	1 year	1 year (extendable)	1 year (extendable)	1 year (extendable)
Company	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	E-Machines, Inc. 9305 S.W. Gemini Dr. Beaverton, OR 97005 (800) 344-7274 (503) 646-6699	E-Machines, Inc. 9305 S.W. Gemini Dr. Beaverton, OR 97005 (800) 344-7274 (503) 646-6699	E-Machines, Inc. 9305 S.W. Gemini Dr. Beaverton, OR 97005 (800) 344-7274 (503) 646-6699

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Table 1: Features of Color Display Systems, continued
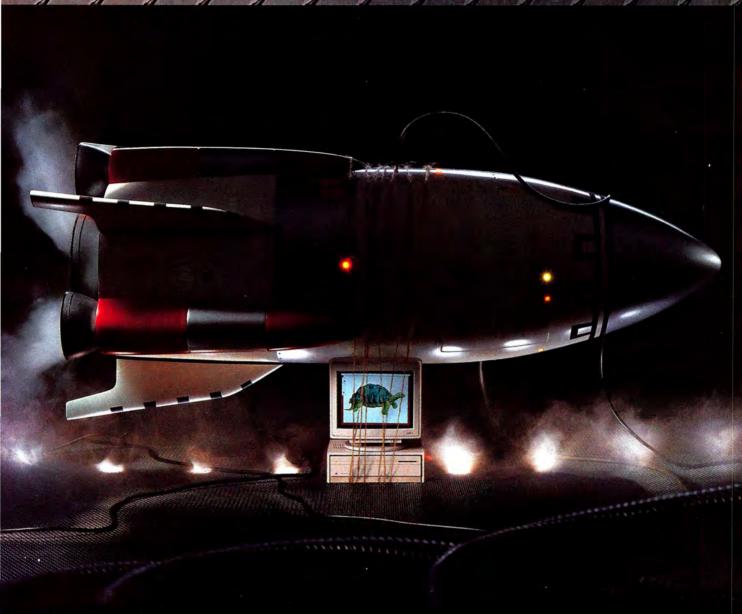
	Generation Systems Color 24 ♦♦♦♦	MegaGraphics 2024 16" ♦♦♦♦	MegaGraphics 2024 19" ♦♦♦♦	Mirror ProView/24 ♦♦♦♦½	Moniterm Viking C24 ♦♦♦♦
List price (system)	$6,299	$6,795	$9,148	$3,997	$7,490
Monitor only	NA	$1,996	$4,349	NA	$3,995
Board only (NuBus)	$2,699	$4,799	$4,799	$1,797	$3,495
Street price (system)	$4,095	$4,999	$5,995	$3,997	$7,490
Pros	Low price. Bright image. Hardware pan/zoom.	Sharp. Good color.	Clear 30-page manual.	Low price. Pan and zoom. Good software. Sharp.	Pan and zoom. Gamma correction.
Cons	Convergence slightly off.	Not WYSIWYG.	Above-average price.	Geometry slightly off.	High price.
Monitor specifications					
Tube type, phosphor	Ikegami Trinitron, P22	Sony Trinitron, P22	Sony Trinitron, P22	Ikegami Trinitron, P22	Ikegami Trinitron, P22
Overall/active screen	20-/17.75-in. diag.	16-/15-in. diag.	19-/17.5-in. diag.	19-/18-in. diag.	20-/18-in. diag.
Active screen area	14.25 x 10.75 in.	11.75 x 9.5 in.	13.75 x 11 in.	14.25 x 10.75 in.	14 x 11 in.
Screen dimensions	1,024 x 768 pixels	1,024 x 826 pixels	1,024 x 826 pixels	1,024 x 768 pixels	1,024 x 768 pixels
Screen resolution	72 dpi	88 dpi	75 dpi	72 dpi	72 dpi
Color modes	2/256/mill.	2/4/16/256/mill.	2/4/16/256/mill.	2/256/mill.	2/256/mill.
Vert.-scan rate	75 Hz	69 Hz	69 Hz	75 Hz	75 Hz
Horiz.-scan rate	60 kHz	60 kHz	60 kHz	60 kHz	60.24 kHz
Bandwidth	80 MHz	100 MHz	80 MHz	80 MHz	80 MHz
Power consumption	150 W; board, 20 W	253 W; board, 20 W	150 W; board, 20 W	150 W; board, 20 W	150 W; board, 20 W
Antiglare treatment	OCLI	OCLI	OCLI	antireflection panel	OCLI
Controls					
Brightness/contrast	front/front	internal/front	internal/front	front/front	front/front
Vert. position/size	side/side	front/internal	front/internal	side/side	side/side
Horiz. position/size	side/internal	internal/internal	internal/internal	side/internal	side/internal
Degaussing	side button	auto at power-up	auto at power-up	side button	side button
Vert./horiz. convergence	side/side	front/front	front/front	side/side	side/side
Other					
Case (W x H x D, in.)	19 x 19.5 x 21	16 x 15 x 18.75	19 x 19 x 21	19 x 19.25 x 20.75	19 x 19 x 21
Weight (pounds)	85 lb	59.4 lb	95 lb	79 lb	90 lb
Tilt/swivel stand	yes	yes	yes	yes	yes
Software	pop-up menus, screen saver & capture, big cursor/menu	gamma correction, pan and zoom	gamma correction, pan and zoom	Desktop Designer Pro, big menu, screen saver, screen capture	gamma correction, pan and zoom
NuBus block transfer	no	no	no	no	no
Warranty	1 year	1 year, 3-year option	1 year, 3-year option	1 year	1 year (extendable)
Company	Generation Systems 1185-C Bordeaux Dr. Sunnyvale, CA 94089 (800) 325-5811 (408) 734-2100	MegaGraphics, Inc. 439 Calle San Pablo Camarillo, CA 93012 (800) 487-6342 (805) 484-3799	MegaGraphics, Inc. 439 Calle San Pablo Camarillo, CA 93012 (800) 487-6342 (805) 484-3799	Mirror Technologies 2644 Patton Rd. Roseville, MN 55113 (800) 654-5294	Moniterm Corp. 5740 Green Circle Dr. Minnetonka, MN 55343 (800) 933-5740, info (800) 343-4969, support

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Table 1: Features of Color Display Systems, continued

	PCPC II 16" Color ♦♦♦♦½	PCPC II 19" Color ♦♦♦♦	Radius DirectColor/24 ♦♦♦♦	RasterOps 24L ♦♦♦♦	Relax Ikegami DM2060 ♦♦♦♦
List price (system)	$3,495	$4,995	$7,890	$8,190	$5,249
Monitor only	NA	$3,855	$4,295	NA	$3,977
Board only (NuBus)	$1,995	$1,995	$3,595	$3,995	NA
Street price (system)	$3,495	$4,995	$5,250	$6,389	$3,999
Pros	Sharp. Good color. Inexpensive. Includes Stepping Out II.	Moderate price. Includes Stepping Out II.	Good color. Versatile software.	Good color. Versatile software.	Low price for 20-inch monitor.
Cons	Not WYSIWYG.	Some misconvergence.	Average price. Not WYSIWYG.	Above-average price.	Uneven focus, convergence.
Monitor specifications					
Tube type, phosphor	Sony Trinitron, P22	Ikegami Trinitron, P22	Sony Trinitron, P22	Sony Trinitron, P22	Ikegami shadow mask, P22
Overall/active screen	16-/14.5-in. diag.	19-/17.75-in. diag.	19-/17.75-in. diag.	19-/17.75-in. diag.	20-/17.5-in. diag.
Active screen area	11.75 x 8.75 in.	14.5 x 10.5 in.	14 x 10.75 in.	13.5 x 11 in.	14.25 x 10.5 in.
Screen dimensions	1,024 x 768 pixels	1,024 x 768 pixels	1,152 x 882 pixels	1,024 x 768 pixels	1,024 x 768 pixels
Screen resolution	82 dpi	72 dpi	82 dpi	72 dpi	72 dpi
Color modes	2/4/16/256/mill.	2/4/16/256/mill.	2/256/thou./mill.	2/4/16/256/mill.	2/256/mill.
Vert.-scan rate	75 Hz	60 Hz (75 Hz, Mar.'91)	71 Hz	75 Hz	75 Hz
Horiz.-scan rate	60 kHz	49 kHz (60 kHz, Mar.'91)	65 kHz	60 kHz	60 kHz
Bandwidth	80 MHz	100 MHz	100 MHz	100 MHz	100 MHz
Power consumption	240 W; board, 8.75 W	220 W; board, 8.75 W	220 W; board, 20 W	330 W; board, 10.5 W	150 W; board, 20 W
Antiglare treatment	OCLI	OCLI	OCLI	OCLI	OCLI
Controls					
Brightness/contrast	internal/front	front/front	internal/front	internal/front	front/front
Vert. position/size	front/internal	side/side	front/internal	front/internal	side/side
Horiz. position/size	internal/internal	side/internal	internal/internal	internal/internal	side/internal
Degaussing	auto at power-up	side button	auto at power-up	auto at power-up	side button
Vert./horiz. convergence	front/front	side/side	front/front	front/front	internal/internal
Other					
Case (W x H x D, in.)	19 x 19 x 21	19 x 19 x 21	19 x 19 x 21	19 x 19 x 21	19 x 19.5 x 21
Weight	85 lb	85 lb	85 lb	84 lb	85 lb
Tilt/swivel stand	yes	yes	yes	yes	yes
Software	Stepping Out II (software for pan and zoom)	Stepping Out II (software for pan and zoom)	tear-off/big menus, screen saver, capture, auto-center dialog	gamma-correction DA, pop-up menus, pan and zoom adjust	gamma correction, pan and zoom
NuBus block transfer	no	no	yes	yes	no
Warranty	1 year	1 year	1 year	1 year	1 year
Company	PCPC 4710 Eisenhower Blvd. Tampa, FL 33634 (800) 622-2888 (813) 884-3092	PCPC 4710 Eisenhower Blvd. Tampa, FL 33634 (800) 622-2888 (813) 884-3092	Radius, Inc. 1710 Fortune Dr. San Jose, CA 95131 (800) 227-2795 (408) 434-1010	RasterOps 2500 Walsh Ave. Santa Clara, CA 95051 (408) 562-4200	Relax Technology 3101 Whipple Rd., #22 Union City, CA 94587 (800) 848-1313 (415) 471-6112

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Table 1: Features of Color Display Systems, continued

	Seiko Instruments 14" Color ♦♦♦♦½	Sigma Designs ColorMAX 8/24 ♦♦♦♦	SuperMac (Hitachi) 19" ♦♦♦♦½	SuperMac (Hitachi) 21" ♦♦♦♦½	SuperMac (Sony) 19" ♦♦♦♦♦
List price (system)	$1,644	$6,095	$6,799	$8,399	$7,199
Monitor only	$899	$4,299	$2,800	$4,400	$4,200
Board only (NuBus)	$745 (RasterOps 264)	$1,795	$3,999 (Spectrum/24 PDQ)	$3,999 (Spectrum/24 PDQ)	$2,999 (Series III)
Street price (system)	$970	$4,299	$4,275	$4,844	$4,212
Pros	Great value, quality. Complete controls.	Low price. Sharp, good focus. No flicker.	Excellent value. Very fast QuickDraw.	Excellent value. Very fast QuickDraw.	Great value. Very sharp. Fast.
Cons	Small screen. No glare protection.	Geometry slightly off.	Few external controls.	Few external controls.	Few external controls.
Monitor specifications					
Tube type, phosphor	Seiko Trinitron, P22	Sony Trinitron, P22	Hitachi Invar mask, P22	Hitachi Invar mask, P22	Sony Trinitron, P22
Overall/active screen	14-/13-in. diag.	19-/18-in. diag.	19-/17.75-in. diag.	21-/18-in. diag.	19-/17.75-in. diag.
Active screen area	9.5 x 7.25 in.	14.5 x 10.75 in.	14.25 x 10.75 in.	15 x 11.25 in.	14.25 x 10.75 in.
Screen dimensions	640 x 480 pixels	1,024 x 768 pixels	1,024 x 768 pixels	1,152 x 870 pixels	1,024 x 768 pixels
Screen resolution	72 dpi	72 dpi	72 dpi	77 dpi	72 dpi
Color modes	2/4/16/256/mill.	2/4/16/256/mill.	2/4/16/256/mill.	2/4/16/256/mill.	2/4/16/256/mill.
Vert.-scan rate	66.7 Hz	79 Hz	75 Hz	75 Hz	75 Hz
Horiz.-scan rate	35 kHz	64 kHz	60.24 kHz	68.68 kHz	60.24 kHz
Bandwidth	25 MHz	100 MHz	80 MHz	100 MHz	80 MHz
Power consumption	150 W; board, 10.5 W	220 W; board, 19 W	135 W; board, 16.8 W	140 W; board, 16.8 W	220 W; board, 18.75 W
Antiglare treatment	none	OCLI	Asahi antireflection	Asahi antireflection	Asahi antireflection
Controls					
Brightness/contrast	side/side	internal/front	front/front	front/front	internal/front
Vert. position/size	rear/rear	front/internal	internal/internal	internal/internal	front/internal
Horiz. position/size	rear/rear	internal/internal	internal/internal	internal/internal	internal/internal
Degaussing	auto at power-up	auto at power-up	auto at power-up	auto at power-up	auto at power-up
Vert./horiz. convergence	internal/internal	front/front	internal/internal	internal/internal	front/front
Other					
Case (W x H x D, in.)	14 x 13.25 x 15.75	19 x 18.75 x 22.25	19.25 x 18.25 x 19.5	19 x 19 x 20	19 x 19 x 21
Weight	33 lb	85 lb	88 lb	70.4 lb	97 lb
Tilt/swivel stand	yes	yes	yes	yes	yes
Software	gamma correction	gamma correction	hardware pan and zoom, QuickDraw acceleration, screen saver	hardware pan and zoom, QuickDraw acceleration, screen saver	hardware pan and zoom, QuickDraw acceleration, screen saver
NuBus block transfer	no	no	no	no	no
Warranty	1 year	1 year	1 year	1 year	1 year
Company	Seiko Instruments USA 1130 Ringwood Ct. San Jose, CA 95131 (408) 922-5900	Sigma Designs, Inc. 46501 Landing Frwy. Fremont, CA 94538 (415) 770-0100	SuperMac Technology 485 Potrero Ave. Sunnyvale, CA 94086 (408) 245-2202	SuperMac Technology 485 Potrero Ave. Sunnyvale, CA 94086 (408) 245-2202	SuperMac Technology 485 Potrero Ave. Sunnyvale, CA 94086 (408) 245-2202

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EASY HARD COPY:
Color PostScript Printers

These five printers make color desktop publishing easy and high-quality presentations affordable.

●

BY
PAUL YI
AND THE
MACUSER LABS
STAFF

T he first chapter of the desktop-publishing saga was printed in black-and-white on an Apple LaserWriter. Chapter 2 will be in full color. And although there isn't a color LaserWriter — yet — there is a solution that works as seamlessly as the original LaserWriter: the thermal-wax color PostScript printer.

Although future color printers will probably use laser technology, today's reigning king of color printing is the thermal-wax-transfer printer. This kind of printer doesn't produce prints as gorgeous as the continuous-tone beauties from laser or dye-sublimation printers, but its ease of use, low media costs, and PostScript abilities have made it the workhorse of color printing (see Figure 1).

Thermal-wax-transfer printers occupy the middle ground of color printing. Other technologies can give you better-quality prints, but be prepared to spend much, much more for the honor of being on the cutting edge of color (see the "On the Horizon" sidebar). At the low end are color inkjet printers that sell for less than a third of the cost of thermal-wax printers. Although inkjet printers offer low-cost methods for performing personal color printing and producing simple business presentations, their image quality is not up to the demands of desktop publishing. Sophisticated business presentations — especially those that require bright, crisp transparencies — also demand quality higher than an inkjet printer can produce.

PHOTOGRAPHY: WALT DENSON

Figure 1: Color Printing

Four-color separation
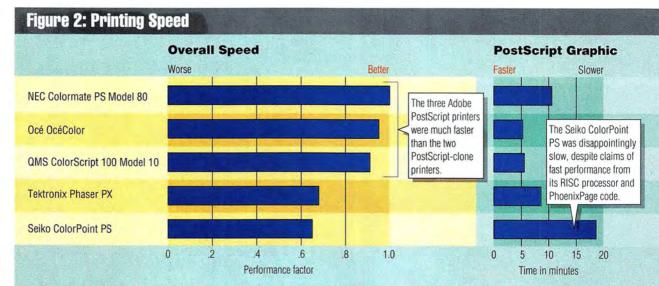
Dye sublimation

Color laser

PHOTOGRAPH BY DAVID MADISON

If you're a desktop publisher who uses color, you need a printer that can produce accurate *comps* — composite images that show, in colorful detail, what your page will include when it returns from the printing press. Of course, no desktop printer can match the color accuracy and high resolution of a professional printing press. Comps

are an intermediate — although necessary — step in the color-desktop-publishing process.

None of the printers we tested are suitable for color *proofing* — the final step in checking a complex color image — because of low resolution and unpredictable colors. A color *matchprint* proof can cost $50 to $100, and it

can take days to be processed by a service bureau. If perfection is not absolutely necessary, a print from a good PostScript thermal-wax printer can give you a usable preview. It's not proof quality, but at 50 cents a page and a few minutes per print, the thermal-wax advantage is obvious. And as Apple and third-party developers

Figure 2: Printing Speed

Overall Speed

Worse   Better

PostScript Graphic

Faster   Slower

NEC Colormate PS Model 80

Océ OcéColor

QMS ColorScript 100 Model 10

Tektronix Phaser PX

Seiko ColorPoint PS

The three Adobe PostScript printers were much faster than the two PostScript-clone printers.

The Seiko ColorPoint PS was disappointingly slow, despite claims of fast performance from its RISC processor and PhoenixPage code.

0   .2   .4   .6   .8   1.0
Performance factor

0   5   10   15   20
Time in minutes

Overall Speed:
We tested how quickly each printer could handle typical color-printing chores. The NEC Colormate PS Model 80 was the fastest, with the Océ OcéColor a close second. Third was the other Adobe PostScript printer, the QMS ColorScript 100 Model 10. The two PostScript clones finished far behind, with the Tektronix Phaser PX edging the

Seiko ColorPoint PS to stay out of last place. Look at the individual tests to see which results pertain to your own printing needs.
PostScript Graphic:
A complex PostScript graphic with colored fills and blends taxed each printer's processor. The illustration was originally created in Swivel 3D and imported and printed from Adobe Illustrator.
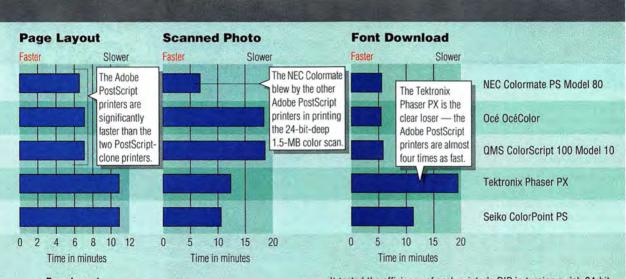
Thermal-wax transfer   Inkjet

Figure 1: Using a thermal-wax-transfer PostScript printer is just one of the color-printing options available to Mac users. The first example is a traditional four-color separation of a 35mm slide. The continuous-tone technology of the dye-sublimation Kodak XL7700 and the Canon Color Laser Copier 500 produces images close to the original. Of the five thermal-wax PostScript printers we tested, the Tektronix Phaser PX had the best image quality — not as good as the continuous-tone or four-color-separation images but superior to the output of the low-resolution Hewlett-Packard PaintWriter Color Graphics inkjet printer.

refine color *calibration* (the ability to include accurate color information in files), thermal-wax printers may solve the color half of the proof problem — even though their resolution will never be near that of a matchprint.

MacUser Labs looked at five PostScript thermal-wax-transfer printers for producing letter-sized printouts. One, the QMS ColorScript 100 Model 10, won our color-printer contest last May (see "Color on the Page," May '90, Buyer's Guide page 56) and is the only repeat contender. It now faces much stiffer competition, however. Two other PostScript printers from last year — the Océ Graphics Océ 5232 CPS Color PS and the Tektronix Phaser CPS — have been upgraded to the Océ Graphics OcéColor and Tektronix Phaser PX. They're joined by the NEC Technologies Colormate PS Model 80 and the Seiko Instruments ColorPoint PS.

As this report goes to press, Tektronix is introducing a new Phaser II line of thermal-wax printers — but

Page Layout
Faster   Slower

The Adobe PostScript printers are significantly faster than the two PostScript-clone printers.

Scanned Photo
Faster   Slower

The NEC Colormate blew by the other Adobe PostScript printers in printing the 24-bit-deep 1.5-MB color scan.

Font Download
Faster   Slower

The Tektronix Phaser PX is the clear loser — the Adobe PostScript printers are almost four times as fast.

NEC Colormate PS Model 80

Océ OcéColor

QMS ColorScript 100 Model 10

Tektronix Phaser PX

Seiko ColorPoint PS

Page Layout: 0 2 4 6 8 10 12 — Time in minutes
Scanned Photo: 0 5 10 15 20 — Time in minutes
Font Download: 0 5 10 15 20 — Time in minutes

Page Layout:
A three-page QuarkXPress document filled with PostScript graphics, scanned photos, hairlines, and text of various sizes taxed everything: processor, engine, and LocalTalk interface.

Scanned Photo:
A 1.5-megabyte scanned photo was printed from Adobe Photoshop.

It tested the efficiency of each printer's RIP in turning a rich 24-bit image into dots of color on the page.

Font Download:
A Microsoft Word page with 17 downloadable Type 1 fonts taxed each printer's LocalTalk interface. The printer must handle printing the page as well as accepting 17 font outlines over LocalTalk.

"We've Broken the Price Barrier to Large Screen Productivity!"

don't worry about our results and conclusions being obsolete. The new Phaser II line uses a similar engine and ribbon, so you can read our observations about the Phaser PX as an early look at the new Phaser II line.

New developments in the color-printer market include significant price reductions. The QMS ColorScript 100 Model 10 was the first to fall below the $10,000 mark, with a price of $9,995 — and it now lists for $1,000 less. Even with this price reduction, the ColorScript 100 ties with the NEC Colormate PS Model 80 and Océ OcéColor for the highest list prices. The Tektronix Phaser PX lists for $7,995, and the Seiko ColorPoint PS is even less than $7,000. With competition this fierce, expect significant savings in street prices (see Table 1).

Color RIPs

All five printers use PostScript as their *PDL* (page-description language) — the software that tells the printer's *engine,* or printing element, how to make up a page. PostScript is the desktop PDL standard, producing high-quality text, graphics, and images. The combination of the PDL software in the printer's ROM and the printer's hardware processor is referred to as the *RIP* (raster-image processor). A PostScript printer RIPs a file that is sent from a Mac, freeing the Mac to do other tasks. A non-PostScript printer requires the Mac to RIP the page.

The extra responsibility of RIPing the page requires hefty processing muscle. The three Adobe PostScript RIPs and the Tektronix Phaser PX's PostScript-compatible RIP run on Motorola 68020 microprocessors (the same chip that runs the Mac LC and the venerable Mac II), whereas the Seiko ColorPoint PS uses an Intel 80960 RISC (reduced-instruction-set computing) microprocessor.

Adobe developed PostScript and sells complete hardware/software RIPs to printer manufacturers. Some printer companies have reverse-engineered Adobe PostScript and have come up with their own PostScript-compatible

How It Works: Color on the Page

Thermal wax   **Color laser**   **Dye sublimation**

Halftone dot
Thermal-wax printers use blocks of pixels to simulate varying shades of color (see enlargements, which are at 800 percent). Color laser and dye-sublimation printers are continuous-tone printers that can vary the intensity of their dots.
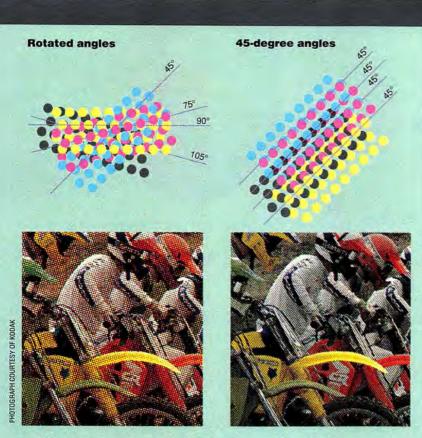
RIPs. The Seiko ColorPoint PS and Tektronix Phaser PX use PostScript-compatible RIPs. These are the two least expensive printers, showing the economic advantage of not paying high royalties for Adobe PostScript.

The Seiko ColorPoint PS uses a third-party PostScript-compatible RIP from Phoenix Technologies called PhoenixPage. Tektronix has developed a proprietary PostScript-compatible RIP for use in the Phaser PX. This is the same RIP we tested in last year's review of the Phaser CPS, the Phaser PX's precursor.

The only compatibility problem we

had last year with the Tektronix RIP was its incompatibility with Adobe Type 1 fonts, the standard fonts used by most PostScript users. Since then, Adobe has opened up the specification for Type 1 code, so most PostScript clones can now print Type 1 fonts, although some still can't read hints (information that varies the shape of characters so that they look better at 300-dpi resolution and small sizes). A Linotronic imagesetter has a resolution of 1,270 or 2,540 dpi, so it doesn't require special hinting to make small characters more legible.

The Tektronix PostScript clone can

Rotated angles

45°
75°
90°
105°

45-degree angles

45°
45°
45°
45°

PHOTOGRAPH COURTESY OF KODAK

Halftone screen

To minimize the interference patterns — *moirés* — that result from overlaying four layers of dots, traditional printing rotates each layer. This approach creates groups of dots — *rosettes* — that the eye finds easy to blend, and it works well for high-resolution electronic prints such as those from Linotronic film. With 300-dpi printers, however, the rosettes become large and too noticeable and prints show irritating moirés.

A better way to print with low-resolution devices such as thermal-wax-transfer printers is to print the four color layers at the same angle, thus eliminating conspicuous rosettes.

four colors: cyan, magenta, yellow, and sometimes black. Black — a combination of cyan, magenta, and yellow — can be used as a fourth primary to add emphasis and image definition. Four of the printers use a four-color ribbon; the Tektronix Phaser PX uses a three-color ribbon.

You need only the three primary colors to create millions of colors (see the "How It Works: Color on the Page" sidebar). All traditional color printing uses this three-color model —for example, every color photo in this magazine is made up of small dots of the three primary colors plus black. The dots are printed in patterns called *screens* in a process called *halftoning*. Your eye blends the screens into a full-color image.

The major problem with the use of screens is interference patterns called *moirés*. To minimize moirés, the four color halftone screens are traditionally printed at angles — usually 45, 75, 90, and 105 degrees — to each other. The rotation creates a pattern of colored dots that works well to create the illusion of a full-color image. Although this works beautifully for high-resolution film, 300-dpi thermal-wax printers have a harder time making the illusion work.

The problem is that for rotated halftone screening to work, each dot must be imperceptible. With 300-dpi thermal-wax printing, however, the dots are relatively large, so moirés remain a problem. At this resolution, a better approach is to print each of four halftone screens at the same angle to alleviate moirés (see the "How It Works: Color on the Page" sidebar).

The NEC Colormate PS Model 80 uses the default PostScript rotated-halftone-screen angles. The Océ Océ-Color and the QMS ColorScript 100 offer either rotated screens or same-angle screens. The Seiko ColorPoint PS has its own proprietary halftoning that uses same-angle screens but also offers an emulation of PostScript rotated halftoning. The Tektronix Phaser PX uses same-angle screens in its proprietary halftoning method.

now handle Type 1 fonts, but it still can't interpret hints. Seiko's Phoenix-Page, on the other hand, is fully compatible with Type 1 fonts, including hints. The three Adobe PostScript printers are fully compatible with Type 1 fonts, hints and all.

Thermal-Wax Technology

After a file is RIPed, it's passed to the printer's thermal-wax engine, where a thermal print head melts dots of colored wax (supplied on ribbons). The wax is then transferred by mechanical pressure onto smooth paper between the print head and a platen

roller. The paper is peeled away, the unmelted wax remains on the ribbon, and the melted wax sticks to the paper. A mirror image of the printout always remains on the ribbon after the printout is completed, so if you're dealing with sensitive data, be sure to dispose of used ribbon in an appropriate manner so a simple mirror won't become a window to your secrets.

After wax of one color has been transferred to the paper, the print engine grabs the trailing edge of the paper and pulls it back for two or three more color passes. Ribbons come on rolls with alternating sheets of three or

Real Color? Sorry . . .

Original slide

Scanner

Macintosh CPU

Application   **Color Picker**

1. The CIE color-space graphs show each device's color gamut — all the colors it can reproduce. The original slide photo has a large gamut. The combination of the dyes and the sensitivity of the film make color photos look bright, saturated, and realistic.

2. As the photo is scanned, viewed on-screen, and then printed, its color gamut keeps changing and shrinking. A scanner tries to mimic human color vision but doesn't do a great job. A monitor then takes the RGB values of the scanned image from the Mac and attempts to display what it can. When the photo is printed, things get much worse. The dyes and technology just can't produce a large gamut.

Imagesetter

Monitor

Thermal-wax printer

C

M

Y

K

3. When the original photo finally appears in print — after enduring further modification in the four-color-separation process — its color gamut has shrunk considerably.

Proof print

Magazine

Newspaper or tabloid

Color on the Mac is not WYSIWYG. What you see on your monitor may or may not be what comes out of your printer, because the millions of colors that 32-bit QuickDraw lets you use have no objective definitions. Scanners, monitors, and printers can digitize, display, and print millions of colors, but the color you get at each stage is different. Mac color is *device-dependent*, and — unfortunately — different devices produce different colors.
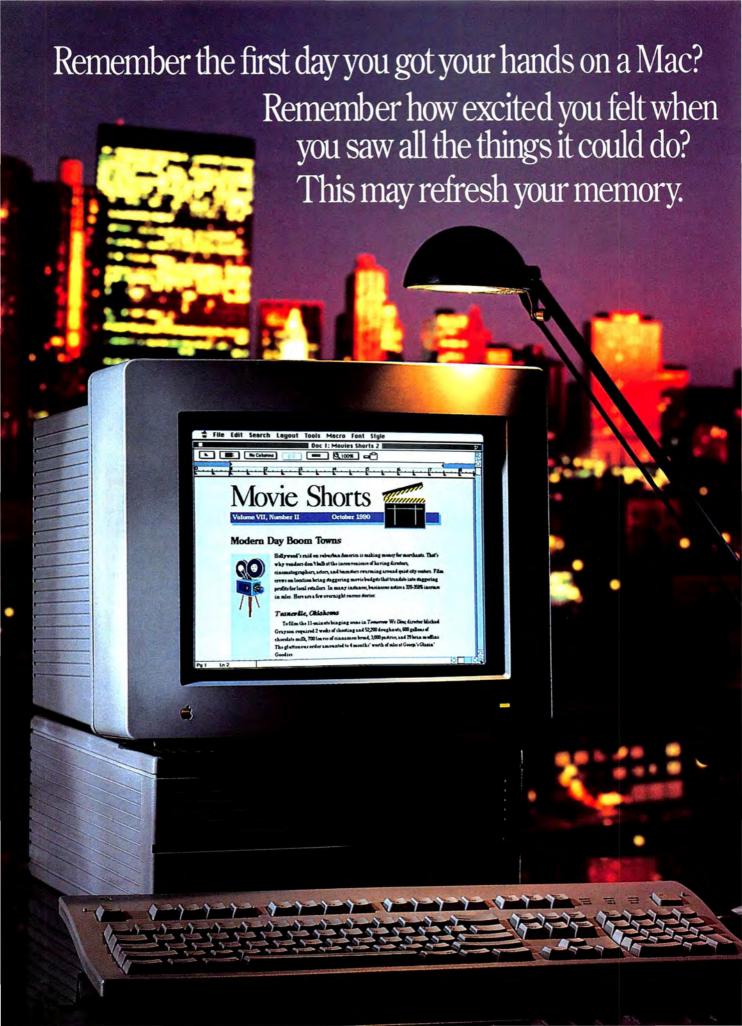
If Mac color is ever to be consistently predictable, color values have to be specified in an objective, device-independent way. At present, Mac colors are specified by the Apple Color Picker, which unfortunately doesn't tell you what the real colors are. The values it specifies are different from monitor to monitor and from printer to printer.

There is, however, an internationally accepted way, called the CIE color space, to name colors objectively. Instruments calibrated to CIE specifications can accurately and consistently report back the CIE coordinates for any color. And systems based on CIE data are currently available for the Mac. Tektronix's TekColor Picker, a replacement for Apple's Color Picker, is based on a CIE-derived objective color space and accurately matches monitor and printer colors. SuperMac has incorporated TekColor into its SuperMatch system, providing consistency for SuperMac monitors and some color printers. Kodak has announced a color format called YCC, which calibrates electronic images by using CIE-based data. Kodak has also announced plans for creating a total color definition, using the CIE color space.

Although this is all good news for color users, the Mac still needs a system-level color-definition method that can integrate these proprietary approaches and link the color process seamlessly and easily. The three companies mentioned have formed a working group on color issues to achieve this goal. The group, called the Association of Color Developers (ACD), will draft a specification that will allow application developers to interface with color systems under a single protocol. Other key companies in the group are Adobe, Aldus, Apple, BarneyScan, Claris, Pantone, QMS, and Radius. There's also an ISO committee, called the IT.8 committee, working on a color file format that will be an industry standard. It will be based on the CIE color space and will also handle issues of compression.

Adobe has also joined the pursuit of better color by announcing that PostScript Level 2 will specify colors in CIE terms. Adobe's new color support will undoubtedly have a great impact on the entire printing market as people take advantage of the other features of PostScript Level 2.

The five printers discussed in this report all claim "Pantone certification," but more than a certification sticker is needed to solve color-accuracy problems with the Mac. Although Pantone inks are used to specify colors in the publishing world, in the world of computers, Pantone is not a real color-definition standard (see "The Pantone Touch" May '90, page 341).

Introducing WordPerfect® 2.0.

Every once in a while a new product comes along that sparks the same kind of excitement you may have experienced with your first Macintosh (you stayed up half the night, right?). As we've shown new WordPerfect® 2.0 to Macintosh users around the country, we've seen a very similar reaction. First eyes open wider. Then heads start to nod. Followed by grins that stretch dimple to dimple.

Here are some of the more graphic improvements.

We built a graphics and drawing package right into the program. With WordPerfect 2.0, you don't have to leave your document to incorporate graphics. You can create, edit, size, scale and crop graphic figures just by clicking "graphics" or "draw" on the pull-down menu. The palette includes all of the standard drawing tools, plus Bezier curves, polygons and a free rotation tool.

WordPerfect 2.0 also lets you create text boxes. Inside your text boxes you can change font size and attributes. Then you can drag your text box wherever you want in your document and the rest of your text will wrap around it automatically.

The list of new features could fill a page. Or up to 24 columns.

By clicking and dragging icons on the new WordPerfect ruler, you can create columns (newspaper or parallel) and then adjust the column settings, align text, set tabs, change line spacing, move margins and do a number of other formatting changes to your document.
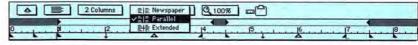
Want to add a border to text, paragraph, column, or page? Easy. WordPerfect 2.0 gives you 36 different border styles from which to choose.

Like working with Styles? WordPerfect not only lets you use them, you can also share your styles with other people on your network.

We've also added new features like a Macro Editor, Tables of Authorities, and Line Numbering. And we've made enhancements to Merge, Search and Replace, and Macros.

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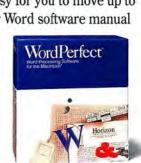
Offer expires May 31, 1991.

WordPerfect
CORPORATION

1555 North Technology Way, Orem, Utah 84057
Tel: (801) 225-5000 FAX: (801) 222-5077

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All the printers in this review print wax dots at 300 dpi — this measurement is known as a printer's *resolution*. When printing colors other than the primaries or black, however, the printers use blocks of dots, each block comprising one primary color, in arrays of either 5 x 5 or 6 x 6. The printer can no longer address the full 300 dpi, because it must use the blocks to build a full-color image. This effectively reduces the "apparent" resolution of color images from 300 dpi to 60 or 50 dpi (in printing terms, 60 or 50 *lpi*, or lines per inch). For line-art and monochrome text, the printers don't need to trade resolution for color range, so output quality is close to that of monochrome laser printers. Technologies such as dye-sublimation and color laser use variable-intensity and variable-dot methods to get smoother colors (see Figure 1 and "Color on the Page," May '90, Buyer's Guide page 56).

Setup

Last year's color-printer roundup was a setup nightmare of NuBus cards, parallel cables, and cumbersome software drivers. This year, however, we made our task easier by focusing on PostScript printers. One definition of a Mac PostScript printer is that it must include a standard Mac LocalTalk-network connection. All you need is a LaserWriter driver in your System Folder and a LocalTalk connection, and the printer will show up in your Mac's Chooser.

All five printers include serial and parallel interfaces in addition to a LocalTalk port. Non-Mac computers use serial or parallel connections. The two PostScript clones offer an advantage for mixed networks: All three ports are simultaneously active. You can print to the Seiko ColorPoint PS and Tektronix Phaser PX simultaneously from a Mac and two IBM PCs, using all three interface ports; the printer arbitrates among the ports and buffers the image as it needs to. To switch ports on the NEC Colormate PS Model 80, Océ OcéColor, or QMS ColorScript 100 Model 10, you have

On the Horizon

Color desktop printing is taking off, and manufacturers are rushing to supply a broad range of output devices for every stage in the publishing process. Tektronix, for example, is introducing a new line of thermal-wax-transfer printers, upgrades for the Phaser PX we looked at in this report. The new Phaser II line starts off with the basic non-PostScript Phaser IISX, sporting a low price of $4,495. The line is modular, so the IISX can be upgraded to the Phaser IIPX, which lists for $7,995 and is a PostScript printer that can automatically switch among ports. At the high end of the new Phaser II line is the Phaser IIPXN ($10,995), one of the first Mac printers to offer an Ethernet interface along with LocalTalk, serial, and parallel ports. Tektronix, Inc., P.O. Box 1000, M-S 63-630, Wilsonville, OR 97070; (800) 835-6100 or (503) 685-3585.

To compete with the less-expensive PostScript-clone printers, NEC is now offering a scaled-down version of the Colormate PS Model 80 we tested in this report. The Colormate PS Model 40 will ship with 4 megabytes of RAM and 17 fonts instead of the 8 megabytes and 35 fonts of the Colormate PS Model 80. It will list for $6,995. NEC Technologies, Inc., 1414 Massachusetts Avenue, Boxborough, MA 01719; (800) 343-4418 or (508) 264-8000.

The new thermal-wax-transfer CalComp ColorMaster Plus ($6,995) is the second color printer — after the Seiko ColorPoint PS — to use the PhoenixPage RIP. The ColorMaster Plus also comes in a version for printing tabloid-sized pages ($9,995). CalComp, 2411 W. La Palma Avenue,

Anaheim, CA 92801; (800) 225-2667 or (714) 821-2000.

The General Parametrics Spectra Star 400 printer series starts with the Model 410 ($5,995), which doesn't include PostScript, and moves up to the Model 430, which provides hardware PostScript built in. The entire line is upgradable and includes the Model 440 ($9,295), which has an internal hard disk, and the Model 450 ($14,995), which lets you output Mac graphics onto slides. General Parametrics, 1250 Ninth Street, Berkeley, CA 94710; (415) 524-3950.

JVC has announced a continuous-tone dye-sublimation thermal-transfer printer with a resolution of 300 dpi. It is scheduled to ship during the fourth quarter of 1991 at a list price of around $25,000. JVC Information Products Company of America, 19900 Beach Blvd., Suite 1, Huntington Beach, CA 92648; (714) 965-2610.

Several companies have announced inkjet printers at both ends of the price spectrum. Iris Graphics offers the SmartJet Series Model 4012, a continuous-tone inkjet printer. Through a patented variable-dot technology, the 300-dpi SmartJet Model 4012 has an apparent resolution of 1,200 to 1,800 dpi. Prices start at $39,000. Iris Graphics, Six Crosby Drive, Bedford, MA 01730; (617) 275-8777.

The Hewlett-Packard PaintWriter Color Graphics printer ($1,395) will feature a new printer driver and color-matching capabilities. HP is also announcing brighter, bolder inks for this printer and its existing line of inkjet printers. The new inks will address the problem of printing to transparencies, a

to physically set the active port on the printer's front panel.

A printer's ability to switch ports automatically is becoming popular, as we saw in the March report on personal PostScript printers (see "Personal PostScript Printers," March '91, page 116). We're also seeing more and more printers that can switch among different PDLs. Besides using different interfaces, computers often use other PDLs besides PostScript. The QMS ColorScript 100 and Tektronix Phaser PX offer HP-GL (Hewlett-Packard's vector-based PDL) emulation, but you still need to select the active PDL on

the front panel of the printer.

All except the Tektronix Phaser PX come with a SCSI port that lets you attach a hard disk for storing downloadable fonts and some printer software. The Seiko ColorPoint PS actually has two SCSI ports built in, but the version we tested didn't support font hard disks. Seiko plans on full support by the time you read this.

Wax and Paper

The hardest part of setting up a thermal-wax-transfer printer is installing the ribbons — and even this isn't too difficult. QMS makes things a little

The continuous-tone Canon Color Laser Copier 500 represents the cutting edge in color output.

noticeable flaw of earlier HP inks. Hewlett-Packard, 19310 Pruneridge Avenue, Cupertino, CA 95014; (800) 752-0900 or (408) 725-8900.

Kodak's Diconix Color 4 ($1,595) is a 192-dpi inkjet printer that prints on plain paper and transparencies. Eastman Kodak Co., 343 State Street, Rochester, NY 14650; (800) 344-0006.

The first of two color laser printers to come onto the Mac market is the Colorocs CP4007 ($29,995) plain-paper color printer, a 300-dpi PostScript-compatible printer that prints at 5 ppm (pages per minute) in full color and 40 ppm in black-and-white. The CP4007 uses a single-pass electrophotographic technology to print on either A- or B-sized paper and on transparencies. Colorocs Corp., 2805 Peterson Place, Norcross, GA 30071; (404) 840-6636.

The second laser printer is the Canon Color Laser Copier 500 ($49,000), which

prints gorgeous 400-dpi images on plain paper and also doubles as a color copier, a slide scanner, and a flatbed color scanner. PostScript ability will soon be available from Adobe, CAI (Custom Applications, Inc.), and Efi (Electronics for Imaging). An optional film scanner, film projector, and other input and output devices are also available. Canon, One Canon Plaza, Lake Success, NY 11042; (516) 488-6700.

Ilford will soon ship a continuous-tone printer, the Digital Photo Imager, which prints in 16.7 million colors on smooth paper, transparencies at 300-dpi resolution, and 35mm slides. Thanks to its liquid-crystal-cell technology, multiple copies can be printed at a rate of up to 180 prints, 120 transparencies, or hundreds of slides per hour. The list price will be around $50,000. Ilford Photo, W. 70 Century Road, Paramus, NJ 07653; (201) 265-6000.

— Darryl Chan

confusing by offering two types of ribbons: one for Pantone-certified colors and another for brighter colors. And although the five printers use different ribbons, they all claim to conform to the Pantone color-definition system — a reason to be wary of claims of "Pantone certification" (see the "Real Color? Sorry . . ." sidebar).

Ribbons come on a roll that installs in a plastic case that then slips into the printer. It's a simple procedure — and you'll get a lot of practice at it, because each ribbon roll is good for only 50 to 120 prints. Four of the printers have paper trays that can hold 100 sheets of

special smooth paper; in the case of the Seiko ColorPoint PS, the paper comes in rolls of 145 prints each.

The roll method of the ColorPoint PS gives it a unique way of increasing the print area. All thermal-wax printers must hold on to a sizable part of the paper to roll it back and forth for each color pass, which limits the vertical image area to about 9 inches on 11-inch-long paper. The ColorPoint PS, because it is not confined to an 11-inch piece to begin with, merely cuts off the section of paper it has been holding, thus allowing a greater print area — as if it had used a larger piece of paper in

the first place. The ColorPoint PS has a print area of 10.7 vertical inches, and a little scrap of paper — the "handle" — is left over, along with the printout in the output tray.
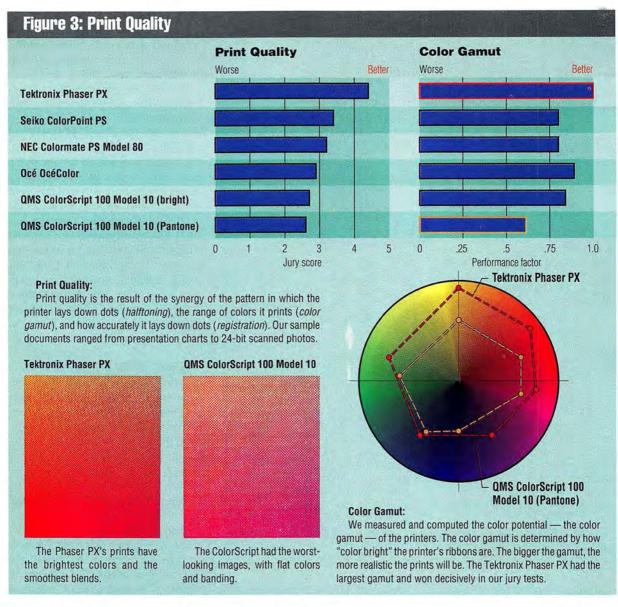
Two of the printers also come in versions that can accommodate tabloid-sized paper — the QMS Color-Script 100 Model 30i ($12,995) and the Seiko ColorPoint B-size ($9,999). Océ will have a tabloid version of the OcéColor for around $16,000, to be named by the time you read this. And speaking of dimensions, the size of the printer itself usually isn't a major factor — until you try to heft the 73-pound Tektronix Phaser PX. In contrast, the compact ColorPoint and OcéColor weigh around 42 pounds. If you're in a crowded office, you'll need to think twice about where you'll put any of these printers — and if you choose the Phaser PX, you'll need a sturdy desk.

Speed Testing

After setting up and loading our five printers, we tested the two aspects desktop publishers are the most concerned with: speed and image quality. Two things — the processor and the engine speed — normally influence printer speed. For thermal-wax-transfer printers, the engine speed is only one page per minute, so in this case, it's the processor that makes the difference.

We passed a range of color documents through the printers to see how well their processors could RIP the images. We started with a relatively simple presentation chart and then printed a complex PostScript graphic, a scanned photo, a page-layout document, and a font-intensive document. Our presentation document was a two-page file with a bar chart, a pie chart, and colored text. The PostScript graphic was a logo first created in Paracomp's Swivel 3D and then imported into Adobe Illustrator. A full-color slide image containing a broad range of skin tones was scanned by a Barney CIS•4520 Slide Scanner; the resulting 1.5-megabyte file was then printed from Adobe Photoshop. The page layout consisted of a three-page

Figure 3: Print Quality

Print Quality
Worse — Better

Jury score (0 to 5)

- Tektronix Phaser PX
- Seiko ColorPoint PS
- NEC Colormate PS Model 80
- Océ OcéColor
- QMS ColorScript 100 Model 10 (bright)
- QMS ColorScript 100 Model 10 (Pantone)

Color Gamut
Worse — Better

Performance factor (0 to 1.0)

Print Quality:
Print quality is the result of the synergy of the pattern in which the printer lays down dots (*halftoning*), the range of colors it prints (*color gamut*), and how accurately it lays down dots (*registration*). Our sample documents ranged from presentation charts to 24-bit scanned photos.

Tektronix Phaser PX

The Phaser PX's prints have the brightest colors and the smoothest blends.

QMS ColorScript 100 Model 10

The ColorScript had the worst-looking images, with flat colors and banding.

— Tektronix Phaser PX

— QMS ColorScript 100 Model 10 (Pantone)

Color Gamut:
We measured and computed the color potential — the color gamut — of the printers. The color gamut is determined by how "color bright" the printer's ribbons are. The bigger the gamut, the more realistic the prints will be. The Tektronix Phaser PX had the largest gamut and won decisively in our jury tests.

QuarkXPress document, which included a variety of text, PostScript graphics, PICT files, and scanned TIFF files. The font-intensive test, which involved 17 downloadable Type 1 fonts, let us evaluate the efficiency of the printers' LocalTalk management and how well the RIP is integrated with the Mac interface.

After the final wax had melted, the speed winner was the NEC Colormate PS Model 80 printer (see Figure 2). The other two Adobe PostScript printers were in second and third place, far outdistancing the two PostScript-clone machines. The poor performances of the Seiko ColorPoint PS and the Tektronix Phaser PX were disappointing, because the ColorPoint PS uses a RISC processor — whose reduced instruction set serves only one function, to print PostScript — and the Phaser PX makes only three passes per print whereas the other printers make four. Each printer had its own personality and handled some types of test prints better than others: Take a look at the individual test results to see which printer is fastest for your most common applications.

The only difficulty we had in running the tests was with LocalTalk on the Seiko ColorPoint PS. When we repeated the tests for statistical accuracy, the ColorPoint's print times sometimes varied by minutes, whereas the other printers varied only by seconds. It turned out that the ColorPoint PS has a bad ROM in its LocalTalk implementation. Seiko reports that it is now working on remedying this problem.

Introducing Color That Out-Neons Neon.

Amazing, isn't it? The monitor image actually out-shines the real thing. Introducing two of the brightest Macintosh-compatible color monitors ever made: the Seiko Instruments 14″ CM-1445, and 20″ CM-2050.

Our new Trinitron* monitors brighten your ideas with a blazing 100 NITs* of color. That's a full 30 NITs brighter than an Apple* MAC II* RGB monitor's maximum of 70 NITs. Which means with us, your colors can be 43% brighter.

Your fire engine reds can be 43% hotter, glacier blues 43% icier, and sunshine yellows can almost give you a tan. In fact, with color brighter than neon in 16 million possible shades, anything you can imagine, you can see. And every eye-popping pixel will be razor sharp because of our high resolution Trinitron tubes.

So if you're looking for color, just use your eyes. You'll see that Seiko Instruments is the brightest choice you can make.

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How do you make the world's most powerful electronic publishing program even more powerful? With XTensions! These add-on software modules are created by independent software developers to extend the features and capabilities of QuarkXPress. Using QuarkXPress as the core of your publishing system and adding XTensions is a cost-effective way to solve complex publishing problems.

Popular XTension applications include links to data bases, automatic pagination, automation of commonly used processes, continuous-tone color separations, and special drivers for scanners. Here are just a few examples of what XTensions can do for you.

Good Looks

To determine image quality, we used a combination of subjective and objective tests. For the subjective aspect, we assembled a jury of color-publishing experts and selected a range of documents for them to rate. They looked at six images, comprising a spectrum of graphics and business documents, from each printer.

To reinforce our jury's opinion, we used a 928 Spectrocolorimeter, from X-Rite, to get an objective measurement of the range of colors the printers can produce — the *color gamut*. We also determined any misregistration of the printers, measured in pixel percentages: We printed one-pixel colored lines to test the accuracy of each color pass.

Compared with the speed results, the winners and losers switched places: The two PostScript-clone printers led the three Adobe PostScript printers, with the Tektronix Phaser PX showing clearly superior halftoning and bright ribbons. Our jurors preferred the Phaser PX's prints over those of any other printer, and they least liked the QMS ColorScript 100's output (see Figure 3). The two PostScript-clone printers had better halftoning than the Adobe printers, and although the QMS ColorScript 100 and Océ OcéColor improved on the normal PostScript halftoning, their prints didn't approach the quality of a Tektronix Phaser PX print.

We then forced each printer to print with identical rotated halftone screens to test the engine and ribbons alone and eliminate any advantages or disadvantages of proprietary halftoning. The results were illuminating: The Tektronix Phaser PX prints still looked the best. Besides having the best halftoning method, the Phaser PX also had the brightest ribbons, as evidenced by its having the largest color gamut. But whereas the Seiko ColorPoint PS finished second to the Phaser PX when using default halftone screens, it fell behind when forced to use the same halftoning method. The consistent loser was the QMS ColorScript 100, with

both the smallest color gamut and the worst overall halftoning method.

The NEC Colormate PS Model 80 is noteworthy for having the best registration of all the printers, although Tektronix Phaser PX came in a close second. The worst registration showed in the QMS ColorScript 100's prints.

Conclusion

Although you can spend less — or a lot more — the best day-to-day way of getting color output from your Macintosh is with a PostScript thermal-wax-transfer color printer. The ease of use, low cost, and availability of these printers are hard to beat. Color laser printing is making inroads, with its plain-paper printing, fast speeds, and variable-dot technology, but at prices of more than $50,000, color laser printers are justifiable only for

large networks. Dye-sublimation printers offer photo-realistic prints, but their price-per-print costs are still too high—around $5 a print. Inkjet printers are ideal for personal color printing, but they just aren't fast or precise enough for graphics use.

If you're a desktop publisher or a creator of high-quality business presentations, you'll find thermal-wax-transfer PostScript printers to be more than adequate for your needs — if you don't set your standards too high. Although these printers can create excellent comps, their ability to produce proof-quality output will have to wait until standards of color accuracy become more widely accepted and color-calibration technology improves.

Paul Yi is a MacUser associate editor who tries to add color to everything in life.

The Bottom Line

Speed, reasonable cost, ease of use, and good image quality make PostScript thermal-wax printers the hands-down choice for color printing — for today, at least.

Our two favorites were the **NEC Colormate PS Model 80** ($8,995) and the **Tektronix Phaser PX** ($7,995). The NEC Colormate PS was the fastest printer of all, performed well in the image-quality tests, and showed the tightest registration. The Tektronix Phaser PX, although not a speed demon, produced the best images. The Tektronix ribbons are by far the brightest, and the Tektronix halftoning method produces the best-looking prints. Keep your checkbook open for the upcoming version of the Phaser PX, the Phaser IIPX.

Our third choice, the **Océ OcéColor** ($8,990), was almost as fast as the NEC

Colormate, and if Océ improved its halftoning, it would also be an image-quality contender. The OcéColor has the second-largest color gamut, behind the Tektronix Phaser PX. The fourth best among the printers we tested, the **Seiko ColorPoint PS** ($6,999), had the second-best-looking prints, thanks to its proprietary halftoning method; the largest print area; and the lowest price — but it was also the slowest and we had problems with the LocalTalk interface (which Seiko promises to fix soon).

The **QMS ColorScript 100 Model 10** ($8,995) was last year's winning color printer — it even got *MacUser*'s Eddy Award for the best color-output device of 1989. But things happen fast in the computer world, and the ColorScript is starting to show its age. Its poor image quality moves it to last place.

Our two favorites were the NEC Colormate PS Model 80 (left) and the Tektronix Phaser PX. The Colormate was the fastest printer in our tests, and the Phaser had the best-looking color output by far.

Table 1: Features of Thermal-Wax-Transfer Color Printers

	NEC Colormate PS Model 80 ♦♦♦♦½	Océ OcéColor ♦♦♦♦	QMS ColorScript 100 Model 10 ♦♦♦½
List/street price	$8,995/$6,895	$8,990/$7,192	$8,995/$6,995
Pros	Fastest. Decent image quality.	Fast. Compact design. Best black-type quality.	Fast. Improved halftoning and ribbons.
Cons	Poor halftoning.	Poor halftoning.	Worst image quality.
Hardware			
Processor, clock speed	Motorola 68020, 16 MHz	Motorola 68020, 16 MHz	Motorola 68020, 16 MHz
RAM (standard configuration)	8 MB	5 MB	5 MB
Additional RAM, price	none	3 MB, $1,200	1 MB, $395; 4 MB, $995 (8 MB max.)
Print-engine manufacturer	NEC	Shinko	Mitsubishi
Hard-disk drive	20 MB, $995	third party	third party
Interface	RS-232, RS-422/LocalTalk, Centronics	RS-232, RS-422/LocalTalk, Centronics	RS-232, RS-422/LocalTalk, Centronics
Auto-switching interface	no	no	no
Resident fonts	35, Adobe	35, Adobe	35, Adobe
PostScript type, version	Adobe, v. 51.9	Adobe, v. 50.3	Adobe, v. 50.3A
Emulations	none	none	HP-GL
Dimensions (W x D x H, in.)	17 x 21.5 x 15	9.9 x 16.1 x 17.5	16.9 x 24.8 x 11.3
Weight	55 lb	42 lb	65 lb
Media handling			
Delivery	sheets	sheets	sheets
Paper sizes	letter, A4	letter, letter +	letter, legal, A4, special A4
Printable area on letter-sized paper	8 x 8.9 in.	8.2 x 9.3 in.	8.1 x 9 in.
Tray capacity	100 sheets	100 sheets	100 sheets
Pantone-certified	yes	yes	yes
Supplies			
Letter-sized paper	500 sheets, $35	600 sheets, $55	2,000 sheets, $125
Letter-sized transparencies	50 sheets, $25.50	100 sheets, $115	100 sheets, $125
Ribbon	150 sheets, $90	200 sheets, $98	120 sheets, $52.50
Cost per letter-sized print	$0.67	$0.58	$0.50
Cost per letter-sized transparency	$1.75	$1.64	$1.70
Warranty	1 year or 24,000 pages (first 90 days, on-site)	1 year	1 year
Company	NEC Technologies, Inc. 1414 Massachusetts Ave. Boxborough, MA 01719 (800) 343-4418 (508) 264-8000	Océ Graphics USA, Inc. 385 Ravendale Mountain View, CA 94039 (800) 545-5445 (415) 964-7900	QMS One Magnum Pass Mobile, AL 36689 (800) 631-2692 (205) 633-4300

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Table 1: Features of Thermal-Wax-Transfer Color Printers

	Seiko ColorPoint PS ♦♦♦♦	Tektronix Phaser PX ♦♦♦♦½
List/street price	$6,999/$6,499	$7,995/$7,895
Pros	Low price. Compact design. Good image quality. Largest print area.	Highest image quality. Largest color gamut. Low price.
Cons	Slowest.	Slow. No SCSI port.
Hardware		
Processor, clock speed	Intel 80960 (RISC), 16 MHz	Motorola 68020, 16 MHz
RAM (standard configuration)	6 MB	6 MB
Additional RAM, price	1 MB, $250 (34 MB max.)	4 MB, $995
Print-engine manufacturer	Seiko	Sharp
Hard-disk drive	third party	no
Interface	RS-232, LocalTalk, Centronics, SCSI	RS-232, LocalTalk, Centronics
Auto-switching interface	yes	yes
Resident fonts	39, Bitstream	36, Bitstream
PostScript type, version	PhoenixPage (Adobe v. 50.3 emulation)	Tektronix v. 2.06
Emulations	none	HP-GL
Dimensions (W x D x H, in.)	14.1 x 17.5 x 8.1	17.4 x 17.2 x 14.7
Weight	41.8 lb	73 lb
Media handling		
Delivery	rolls (paper and transparency)	sheets
Paper sizes	letter, A4, A Super	letter, legal, A4 special folio
Printable area on letter-sized paper	8.2 x 10.7 in.	8.1 x 8.8 in.
Tray capacity	145 prints per roll	100 sheets
Pantone-certified	yes	yes
Supplies		
Letter-sized paper	145 sheets, $10.15	1,000 sheets, $53
Letter-sized transparencies	120 sheets, $87.60	50 sheets, $57
Ribbon	172 sheets, $68.80	342 sheets, $135
Cost per letter-sized print	$0.47	$0.45
Cost per letter-sized transparency	$1.13	$1.54
Warranty	90 days	1 year
Company	Seiko Instruments USA, Inc. Graphics Devices & Systems Division 1130 Ringwood Ct. San Jose, CA 95131 (800) 873-4561 (408) 922-5800	Tektronix, Inc. Graphics Printing & Imaging Division P.O. Box 1000, M-S 63-630 Wilsonville, OR 97070 (800) 835-6100 (503) 685-3585

Criteria

List/street price — The list price is the manufacturer's suggested retail price. The street price is an average actual price charged by dealers around the United States in January 1991.

Processor, clock speed — The manufacturer and speed of the chip that processes the PostScript data sent from your Mac.

RAM (standard configuration) — The amount of on-board memory standard with the printer.

Additional RAM, price — Any optional memory upgrades and their price.

Print-engine manufacturer — This is often not the same company that sells the printer.

Hard-disk drive — If the printer has a SCSI port, you can attach a hard-disk drive, either from a third party or from the printer vendor.

Interface — Interfaces other than LocalTalk connect the printer to IBM PCs.

Auto-switching interface — Some printers can intelligently auto-switch among interfaces without users having to configure them.

Resident fonts — The number and type of fonts in the printer's ROM.

PostScript type, version — The type and version number of the Post-Script or PostScript-clone code in the printer's ROM.

Emulations — Some of the manufacturers provide popular printer languages.

Delivery — Either stacks of sheets or rolls of paper.

Paper sizes — Most printers handle the popular sizes, with some offering special letter sizes to increase the printable area.

Printable area on letter-sized paper — Thermal-wax printers usually have much smaller printable areas than do laser printers.

Tray capacity — These printers have limited paper-tray capacities, because of the thickness of the special smooth paper.

Pantone-certified — All of the printers carry the Pantone seal of approval.

Letter-sized paper — The number of sheets and the cost of the special smooth paper.

Letter-sized transparencies — The number of sheets and the cost of transparent media.

Ribbon — The number of copies and the cost of a ribbon.

Will color matching be the next technology to acquire a standard? Each product — TekColor, SuperMatch, Radius Toolkit, Photo YCC, and so on — currently has a different interface, but the color vendors have joined forces to create a protocol that will let you (or rather, your application) access every color-matching product in the same way. The (as yet unnamed) standard will force products to compete strictly on functionality and color WYSIWYGness. ETA: summer 1991.

By Aileen Abernathy

Teaching an old font new tricks: FontMonger, from Ares Software ([415] 578-9090), rolls the best of Metamorphosis, ParaFont, and Art Importer into one must-have utility. Developed by the same team that created Letraset's FontStudio, FontMonger converts type formats in any direction among Type 1, Type 3, and TrueType. You can turn type into Illustrator or EPS files or take the reverse tack and turn EPS images into font characters. But wait, there's more: You can combine characters from different typefaces into a single font, or you can make a font with customized characters such as obliques, fractions, and small caps. All this for $99.95. Hot, hot, hot.

Xpanding horizons: Page Director fills a void in Mac-based publication-management tools. This $895 program from Managing Editor Software ([215] 635-5074) focuses on production, not design, and can track, assemble, and configure all the elements of a newspaper (or magazine) page. One catch: It's a QuarkXTension, so tough luck if you use PageMaker. •• Speaking of QuarkXTensions, more than 30 of these third-party modules are now available, adding specialized features such as database publishing, indexing, and pagination. To get a free QuarkXTensions catalog, send Quark a postcard (trust me, it's faster than calling). •• Quark has also released two free QuarkXTensions: NetworkConnection, which adds groupware capabilities, and FeaturesPlus, a collection of utilities for setting preferences, making fractions and prices, and more. Both are available from on-line services or from Quark ($25 shipping). •• Finally, Quark is offering Passport, a multilingual version of QuarkXPress 3.0 that lets you choose among 12 languages for both text and menus within a single document (spelling and hyphenation dictionaries included). A mere $2,495.

Product news: Eddy Award nominee FrameMaker 2.1 is still less than a year old on the Mac, but Frame ([408] 433-3311) is about to push version 3.0 out the door. The most significant new feature is the comprehensive tables package, but the upgrade also adds conditional-text capabilities; more import/export filters; and improved color features, including support for the DCS and OPI standards. The rev is due out by June, with an upgrade price of less than $200. •• Effects Specialist from PostCraft ([805] 257-1797) offers 120 canned styles that work on any font, including non-PostScript and bit-mapped varieties. You can't hand-tweak the letter shapes, à la TypeStyler, and you have only eight color choices, but it's a no-brainer way to create instant display type. $199.95. •• Timeworks ([800] 535-9497) is now offering special site licenses for schools: ten copies of Publish It! Easy 2.0 for $300. Heck of a deal. ▨

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Designing for Fax

Faxes are becoming as important to business communications as a printed letterhead — and they should be designed just as thoughtfully.

By Kathleen Tinkel

T ime-saving, attention-getting facsimile transmissions — a.k.a. faxes — have become an essential tool for huge corporations and tiny businesses alike. In spite of their usefulness, however, most faxes are homely things to look at. The slippery and sleazy paper doesn't help, nor do the broken lines and occasional blobs that result from phone-line noise. But the faxed ugliness goes beyond that, as if the senders are thinking, "Aw, they're just for quick communications. No one expects them to look good."

Think again. Faxes represent you, just as your business card and letterhead do. If you're concerned about making a good impression, be sure your faxes look as professional as the rest of your stationery. Unfortunately, the mechanics of fax transmission create a special set of design problems — you can't fax just *anything* and expect good results. To help you put your best fax forward, here are some tips and techniques I've uncovered as copublisher of a weekly faxed newsletter and as the recipient of hundreds of faxes from around the world.

Just the Fax

The capabilities of the sending fax machine (or fax modem) can greatly affect how you design a fax document. If your fax machine gives you control over 64 levels of gray, for example, you can send a realistic-looking photograph to any fax machine, even one that doesn't have gray-scale capabilities itself. Or

perhaps your fax machine accepts large originals (roughly 10 x 14 inches); you can certainly send oversized pages, but unless the receiving fax machine supports wide paper (which is rare), your documents will be reduced to fit a smaller sheet. Also keep in mind that whereas most fax units offer two resolution settings — Standard and Fine — faxes are usually sent at the lower-quality standard resolution, which is faster and cheaper. For these reasons (and more), you should design your faxes conservatively and be sure they are readable and attractive at standard resolution, even if you expect to send most of them at fine resolution.

Fax modems usually produce better-looking faxes than do stand-alone machines, because they send original documents directly from the computer without an intermediate scanning step that degrades image quality (see "Fast, Full-Featured Fax Modems," in this issue). The best image quality comes from a fax modem set to fine resolution, whereas a fax machine at standard resolution produces the worst (see Figure 1). For all fax units, fine resolution is 203 x 196 dpi and standard resolution is 203 x 98 dpi. Although fax resolution sounds as if it should be roughly two-thirds as good as a laser printer's 300 dpi, the arithmetic doesn't work out that way. The actual effect on type and graphics depends on the number of dots each device can fit into a *square* inch. A laser printer provides 300 x 300 dpi, or 90,000 dots per square inch, whereas a fax unit provides only about 40,000 (actually 39,788) dots per

Figure 1: Typeface Selection

Adobe Garamond, a faxed example of the typ

Frutiger 55 Roman, a faxed example

Hiroshige Medium, a faxed example

Italia Medium, a faxed example of the ty

Lucida Roman, a faxed example of

Palatino, a faxed example of the type.

Stone Sans, a faxed example of the typ

Fax modem, fine resolution

Adobe Garamond, a faxed example of the ty

Frutiger 55 Roman, a faxed example

Hiroshige Medium, a faxed example

Italia Medium, a faxed example of the ty

Lucida Roman, a faxed example of

Palatino, a faxed example of the type.

Stone Sans, a faxed example of the typ

Fax machine, standard resolution

Figure 1: When designing a fax, choose the typeface based on your fax equipment and resolution. A fax modem coupled with ATM provides the best text output, giving you the widest choices in typefaces and point sizes. Conventional fax machines at standard resolution fare the worst with type; stick to simple faces (preferably sans serif) in large point sizes (at least 12 points).

square inch at fine resolution — less than half the resolution of a laser printer.

Fax machines and fax modems have inherent disadvantages related to their features and ease of use that can affect the way you design documents. Conventional fax machines are often more convenient, particularly if most of your documents are not computer-generated. However, their low-precision scanners can introduce physical problems such as skipped scan lines, stretched characters, and vertical white lines. The originals may feed crookedly, causing straight lines (including those within type) to wind up broken and jagged (see Figure 2a). Specks of dust, fingerprints, and paper creases can all be transmitted as part of a document.

If your original document comes from a printer that produces a dot pattern (a category that includes laser, inkjet, and dot-matrix printers), the resolution mismatch between it and the fax machine can further degrade image quality, creating thicker lines, darker type, and blotchy artwork. This can be particularly troublesome if your fax includes small type sizes or intricate artwork.

Finally, few stand-alone machines make it easy and economical to send faxes at fine resolution. Only expensive machines offer features such as scheduling (so that faxes can be sent at a time when phone rates are lower), programmability (for sending multiple documents), and the ability to change the resolution to fine for all transmissions. Without these features, you're more likely to use the money-saving standard resolution than the image-enhancing fine resolution.

Peculiarities of Fax Modems

Fax modems offer more scheduling features than do stand-alone machines, and they avoid the image problems associated with scanning printed originals. However, fax modems transmit images as electronic bit maps, which places a different set of limitations on the handling of type and graphics. These problems — such as scaling distortions caused by the differing resolutions of the Mac's screen (usually 72 dpi) and the fax protocol (203 dpi horizontally) — are nonexistent with paper-fed fax machines.

The best way to image type for a fax modem is through Adobe Type Manager 2.0. ATM uses the power of PostScript to create crisp text on-screen at any size, and the fax modem transmits that scaled type directly. If you don't use ATM, the only way to avoid jagged-looking type is to install bit-mapped screen fonts that are three times the size of those in your document. The fax-modem software uses the oversized fonts to scale the type correctly for transmission, but this option can be limiting. Only a few fax-modem vendors supply the necessary triple-sized fonts, and those that do usually provide only a limited selection of sizes and faces (often just Times, Helvetica, and Courier). If you want to use 11- or 13-point type for legibility (easy to do with ATM), you'll first have to find or make 33- or 39-point bit maps. With ATM, you avoid all these problems. (Keep in mind, however, that ATM works only with Type 1 PostScript fonts. Chicago, New York, and other bit-mapped faces will still suffer from the jaggies if you don't have triple-sized fonts installed.)

Sending graphics via fax modem poses some resolution-related problems that are easier to solve on a conventional fax machine. On the positive side, images composed of vertical, horizontal, and 45-degree lines work just fine — perhaps better — with a fax modem, because there's no opportunity to insert a piece of paper crookedly. Curves and lines at other angles fare less well, with a tendency toward the jaggies. Intricate bit-mapped artwork (in MacPaint, PICT, or TIFF formats) is often very effective, yielding an etched look.

However, unless your fax modem has gray-scale capabilities (which only the Prometheus Products Maxfax offers at

Figure 2: Design Considerations

Fax modem

Fax machine

Figure 2a: Hairline rules come across fairly well at fine resolution, although they suffer some distortion when sent through a fax machine (bottom). The scanning process thickens the lines, partially obliterating the type (particularly the smaller face); also notice the "stair-stepping" of lines, caused by feeding the document crookedly.

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1234 ANYWHERE BOULEVARD
EVERYTOWN, ANYSTATE 98765
PHONE 123 456-7890
Fax modem

URSO
1234 ANYWHERE BOULEVARD
EVERYTOWN, ANYSTATE 98765
PHONE 123 456-7890
Fax machine

Figure 2b: Large bold type works well for faxing (Helvetica Inserat is shown here). Even small bold type is readable when sent via fax modem (left), which tends to lighten type, but it should be avoided on a conventional machine (right), which causes the lines to thicken and the openings to fill in.

Comp

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Fax modem

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Fax machine

Figure 2c: With a fax modem, you can safely print type over a 20- or 30-percent screen (top left). The faxed output from a laser printer is too coarse and makes the text hard to read (top right). Bold type reversed out of a black background works well for all faxes (center). However, outlined type (bottom) poses a problem either way: A conventional machine makes the outline too heavy, whereas a fax modem produces lines that are too light. You're better off avoiding outlines and sticking with solid-black letters.

this writing), photographs and screened artwork are lost causes. Gray tones in the original image are converted to stark black-and-white blocks for transmission, often obscuring the contents (see Figure 3). A conventional fax machine with gray-scale and contrast controls does a much better job of handling such images. Likewise, PostScript graphics usually look better if they are printed on a laser printer and then scanned into a fax machine. None of the

Mac fax modems currently include a PostScript interpreter, which would bring the language's device- and resolution-independence to faxing. Because fax-modem software isn't able to interpret PostScript code, it sends a low-resolution (PICT) screen image instead. (If an EPS file doesn't include an embedded PICT, the image will be replaced by a rectangular placeholder.)

Finally, interactions among fax-modem

software, the Mac's operating system, and other resident applications may affect the appearance of your faxes, creating problems such as erratic type spacing or truncated lines. BackFAX, for example, has compatibility problems with hard drives formatted with La Cie's Silverlining software: It can run on such a drive, but it produces data errors, some of which show up as oddly formatted faxes. Most fax modems don't support fractional font

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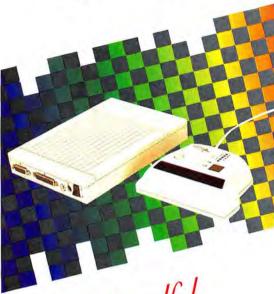
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widths, so you must turn off the tracking in programs such as PageMaker and QuarkXPress in order to avoid weird letterspacing. The original Abaton InterFax 24/96 fax modem was incompatible with QuarkXPress 3.0, but this was fixed by release 1.2 of the InterFax software. (If you're having problems sending Quark-XPress documents and have an earlier version of the InterFax software, contact Abaton for an update to version 1.2.2 or later.)
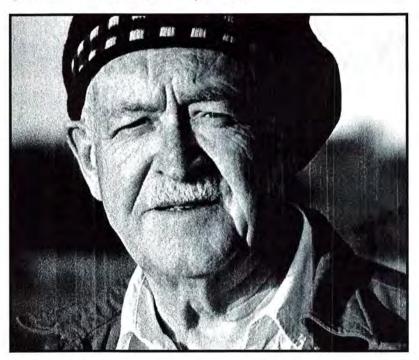
Figure 3: If your fax machine has gray-scale features, you can transmit a realistic-looking photograph (the top image was faxed at fine resolution). If it doesn't have this capability, the image will be converted to black-and-white and much content may be lost.

Choosing a Typeface

Before you begin worrying about the image they project, you should first make sure your faxes are readable. Faxed text has a dot pattern that's visible to the naked eye. Typefaces and styles that work well for laser-printed correspondence may be too small and light for faxing — you may find that increasing the type size from 10 points to 12 or 13 points helps readability. And some faces are clearly better at surviving the vicissitudes of faxing than others (see Figure 1).

A couple of years ago, Adobe tested the faxability of several typefaces and found that Lucida Roman, Lucida Sans, and Stone Sans worked best. (The results were published in Adobe's type catalog, *Font & Function*.) I ran some tests of my own, not limited to Adobe fonts, and found that these faces do indeed work well, along with Bitstream Charter; Adobe Utopia; and sans serif faces such as Frutiger, Helvetica, and Univers. These typefaces (and probably others that work well) share three characteristics:

• The letters have relatively unvarying, moderately heavy line weights.

• Openings within the characters (in the *e* and *a*, for example) are large.

• The letters are relatively plain. In general, sans serif typefaces work better than serif ones.

I conducted all these tests with conventional fax machines. If you're using a fax modem and have ATM, however, you can use a much wider range of fonts — in fact, almost any PostScript font works well. Although conventional fax machines tend to thicken lines, obliterating small text, fax modems tend to lighten them (see Figure 2b), which means that you can often use smaller font sizes and typefaces that have smaller letter openings.

Design Fundamentals
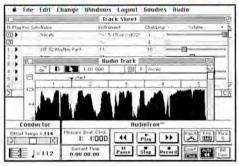
Once you've mastered the peculiarities of the fax format, creating a fax document is just another design project. I've already covered some considerations specific to fax machines, fax modems, and typeface selection. Here are the highlights plus a few more points to ponder:

• Don't use your printed letterhead for fax documents. Many things that are effective in print — embossing, foil or other metallic type, screened or pale type, very small type — can't be communicated effectively by fax. Instead, use a special fax letterhead with a related design.

• Keep type and images away from the margins so that they aren't truncated by the faxing process. Margins of three-quarters of an inch all around seem safe.

• Phone lines can introduce visible errors, so choose typefaces and graphics that can survive missing or doubled-up lines. Sans serif faces are generally safer than serif faces, particularly if you use a fax machine. Graphics fare best if they have strong angles or bit-mapped textures.

• If you're using a conventional fax machine, avoid layouts with long straight lines, small type sizes, and intricate artwork. Misfeeds and phone-line noise cause unsightly broken lines, and the scanning process can thicken lines and darken type, causing text to become unreadable and turning artwork into a blotchy mess.

• For superior text output from a fax modem, use ATM with Type 1 fonts or be sure that your installed fonts include sizes that are three times as large as those in your documents.

• Avoid overlaying type on an illustration or screened area, especially if you use a fax machine (see Figure 2c). At best, the edges of letters will look fuzzy; at worst, characters will virtually disappear.

• For special emphasis, try reversing white type out of a black background. A sans serif typeface set in 18-point bold works well.

• Don't fax photographs or other gray-scale artwork if your equipment lacks gray-scale and contrast controls (or you don't use them). Either create a posterized (black-and-white contrast) version of the artwork, or skip it altogether.

• If you have to send PostScript illustrations from a fax modem, create them at roughly three times the desired finished size and then export and reduce them in a layout program before faxing. This process enhances the apparent resolution of the embedded PICT image, minimizing the jaggies you normally get when faxing the PICT portion of a PostScript object.

• Most fax machines let you duplicate a document by passing it through the scanning mechanism in Copy mode. Although this is useful for seeing how the layout works on the fax page, it doesn't show you the alterations produced by the phone lines and shouldn't be used as a faxability test.

• Cover pages waste paper and are redundant if you also address the pages that follow. On the other hand, fax machines are often shared and a well-designed cover page helps direct the document to the right person. Unless you're concerned with confidentiality while the fax is awaiting pickup, your cover page can simply be the top part of the first document page. 🖾

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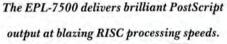
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BRIDGES

Midget modem for Macs on the run: Outbound, maker of the Outbound Laptop System, now offers the Pocket Port, a 2,400-bps Hayes-compatible modem. Weighing only 2.4 ounces and literally small enough to fit into your shirt pocket, the Pocket Port requires no battery, because it gets its power from a telephone line. $279.

NetWare news: NetWare 3.11 (formerly dubbed NetWare 386) and NetWare for Macintosh 3.0 are finally shipping. NetWare for Macintosh 3.0 integrates AppleShare-like file service and AppleTalk print spooling as part of its core technology. Novell says the new version should provide twice the performance of the current version, 2.15c. NetWare 3.11 costs $3,495 for 20 users, $6,995 for 100 users, and $12,495 for 250 users. If you also want NetWare for Macintosh 3.0, add $895 for 20 users and $1,995 for 100 users.

DataViz is now shipping MacLinkPlus version 5.0, which offers new translators for Word for Windows, WordPerfect 2.0/Mac, MultiMate 4.0, FrameMaker, and Windows graphics. Version 5.0 also includes the new version of Dayna's DOS Mounter for one-stop DOS-to-Macintosh file swaps. $199; upgrade for registered owners, $50. ↝ Want to toss your NeXT machine into the file-exchange picture? DIT's FloppyWorks enables a NeXT computer with a floppy drive to read from and write to Mac disks directly. It also contains filters for file translation between popular Macintosh and DOS applications. $250.

Macs without Apple? It may soon — at long last — become reality. RDI Computer is selling Companion, Mac-emulation software that runs on SPARCstations. According to RDI, any application that runs on an SE or Classic can run under Companion. At press time, Companion required an S-bus card with Mac Classic ROMs installed to function properly and cost $1,695 (S-bus card included, but you supply your own ROMs). RDI expects some legal complications to have been resolved by the time you read this, so it can sell Companion as a software-only product for $895. ↝ Meanwhile, Nutek Computers is readying Macintosh-clone technology it says is Apple-lawyerproof. This technology is a combination of custom ROMs and system software that can run Mac applications but gives them a slightly different look: that of the Open Software Foundation's Motif interface, which is common on UNIX machines. All Nutek needs to do now is find a hardware manufacturer to develop its product into a usable computer — and keep Nutek company in the courtroom. ▨

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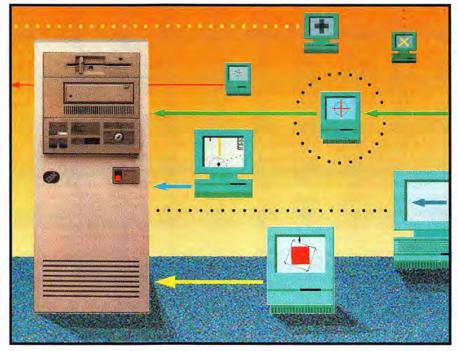
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The Mac-to-Mini Connection

Connecting the Mac to IBM's midrange computers gives you minicomputer power with Mac ease of use.

By Teresa Elms

When the Mac meets the minicomputer in the business world, the result is often confrontational. But things are smoothing out in a rather improbable quarter: the IBM midrange-computer market. Users of these business minicomputers are "speaking Mac" in a growing number of companies, thanks to a flurry of new connectivity products.

Midrange computers are business-oriented minicomputers. Minicomputers comprise the middle tier of computer power and price. They're more powerful and more expensive than desktop computers but are less powerful and less expensive than mainframes. IBM's current midrange computer is the AS/400. It supersedes the System/34, System/36, and System/3X (collectively known as System/3X machines), although these machines are still used widely. According to IBM, approximately 400,000 System 3/X and AS/400 minicomputers are installed worldwide. Attached to those systems are an estimated 5 million terminals — a quarter of which access the data on the midrange host. This is a large market by any standard, and it's growing faster than the computer industry as a whole.

This growth is significant for Mac users. By connecting Macs to a midrange system, users gain access to large-system processing power, easy data exchange with PCs or Macintoshes

anywhere on a network, and the security of a centrally managed database. The Mac also brings advantages to midrange-computer shops, including user-friendly applications and its famous graphical user interface.

One of the earliest, most successful combinations of the Mac and IBM midrange computers was at Apple, which uses AS/400s for corporate information processing. Instead of the "dumb," character-oriented terminals traditionally connected to such systems, Apple uses a network of Macs. The Macs work independently of the AS/400s for tasks such as word processing and graphics, which the AS/400s don't do well. But the AS/400s provide computing horsepower for the high-volume number crunching needed to manage corporate order processing, accounts payable, and sales reporting. They also provide shared access to corporate databases. With a click of the mouse, users can access the best of both worlds.

Making Connections

To integrate the Mac into an IBM-midrange-computer network, you need a fast, reliable connection to the midrange host. There are a few choices here. Most System/3X and AS/400 computers support these options:

• Medium-speed (up to 19.2 kbps), asynchronous communications via an RS-232C serial port and a modem.

• High-speed (up to 56 kbps), synchronous communications via an RS-232C or a variety of other serial interfaces to a modem or to digital phone lines. This is the standard IBM midrange-communications mode.

• Very-high-speed (1.2 megabytes per second) attachment via twin-axial cable, which is the wiring that connects dumb terminals and printers to an IBM midrange system.

• Connection via Ethernet LAN (local-area network), which is available on the AS/400 only.

• Connection via token-ring LAN, which delivers 4 to 16 megabytes per second — the best communications performance available on IBM midrange systems.

To connect the Mac to a midrange system with any of these communications options, you must install a communications controller (such as a token-ring-LAN adapter or a 5250-emulation board) in one of the Mac's expansion slots or connect an outboard box (such as a protocol converter) to the Mac's modem port. The controller card or protocol converter then connects to the cabling system — such as the twin-axial cable in the building's walls — that carries data between your Mac and the midrange system. Current Mac-to-midrange connectivity products support either twin-axial or token-ring connections. Of these, the twin-axial connection is the more popular, because it's fast, reliable, relatively inexpensive, and available on all IBM midrange systems.

Translating Mac to Midrange

Establishing a connection between the Mac and a midrange system is like placing a phone call to France. If you dial the right number with the right equipment, you can *hear* your French counterpart speak, but if *you* don't speak French, you can't communicate. Terminal-emulation software provides the Mac equivalent of a French interpreter. This software runs on your Mac and supports three key connectivity services: terminal emulation, printer emulation, and file transfer.

Terminal emulation. Terminal emulation lets the Mac communicate like the dumb, text-based terminals the midrange system understands. During this process, the Mac window that the emulator runs in temporarily gives up its independent computing power and becomes a "slave" of the midrange system.

The midrange system sends character data — but not graphics — to a Mac window just as it does to an IBM 5250-series terminal. The midrange system codes this data in EBCDIC (extended binary-coded decimal interchange code) rather than in ASCII, so you require terminal-emulation software to translate the incoming data to ASCII equivalents the Mac can

display. Conversely, the midrange system expects to receive keystrokes from the Mac that map to the standard 5250-series keyboard, and it needs special function keys (such as Attention and Error Reset) that don't exist on the Mac. The terminal-emulation software on your Mac performs this keyboard-mapping function.

A note about selecting the right terminal-emulation software: Emulation software that works with IBM midrange systems does *not* work with IBM mainframes. Your Mac must emulate a 5250-series terminal to be understood by midrange computers, and *only* midrange computers accept 5250 emulation. IBM mainframes require the much different 3270 terminal-emulation protocol. To confuse matters further, emulation software that works with IBM mainframes *might* work with an AS/400, but only if special hardware and software are installed on the AS/400 to support 3270 terminals and printers. (For more information on Mac-to-mainframe connectivity, see "Face to Face with Your Mainframe," February
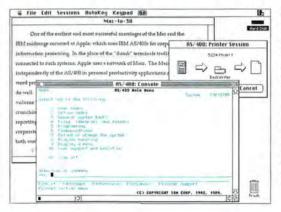
Figure 1: Connecting your Mac to an IBM midrange system lets you access the minicomputer's power without losing your Mac's intelligent features. You can run multiple midrange jobs in separate windows, view them concurrently on one or more monitors, and run a native Mac application (such as a word processor) at the same time.
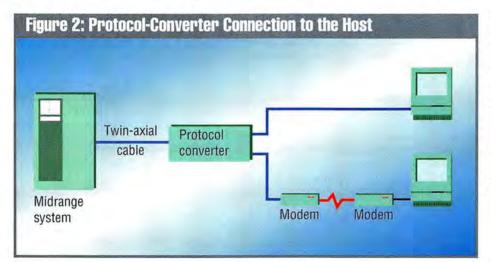
Figure 2: You can connect your Mac to a midrange system with a protocol converter — a box that connects to the modem port of your Mac and provides an interface to the midrange's twin-axial-cable network. Protocol converters work with any Mac model, and they can connect multiple Macs to a midrange system — but they're slow compared with other connectivity options.

'90, page 276, and "Mac-to-Mainframe Mating," January '90, page 260.)

Printer emulation. Printer emulation is an extension of terminal emulation: It translates the printer-data stream from the midrange computer into QuickDraw or PostScript commands that your printer understands.

You need to follow a few rules to get terminal or printer emulation to work. Most importantly, you need to specify a correct device address each time you configure a terminal or printer session on your Mac. (You can configure as many as seven sessions at a time.) The device address is a number the midrange system uses to route message traffic among hundreds of 5250 terminals. The midrange system permits only seven device addresses per midrange port, and because you can have more than one Mac connected to a port, you may prevent other users from signing on to the midrange system if you configure too many emulation sessions on your Mac.

File transfer. The final piece of the Mac-to-midrange puzzle — file transfer — is a two-step process. First the midrange system's EBCDIC codes must be translated to ASCII for downloading to the Mac and vice versa. Then the file-transfer software must reformat data to and from standard formats, such as tab-delimited ASCII.

File-transfer software usually comes in two parts: one for the midrange system and one for the Mac. You don't have to buy both halves from the same software developer. For example, a widely used file-transfer product for midrange systems is ETU (Emulator Transfer Utility), from Andrew, formerly called Emerald Technology. Because it runs on a wide variety of IBM midrange computers, many manufacturers write file-transfer software for desktop computers that works with ETU on midrange computers. But this isn't always the case: IDEAssociates' IDEAcomm Mac 5250-emulator board includes file-transfer software for both the Macintosh and the midrange system in one package.

The Best of Both Worlds

Terminal emulation, printer emulation, and file transfer may seem like primitive connectivity functions, but the result is a beautiful synergy of Mac and midrange strengths. For example, DOS terminal emulation requires that you give up your Macintosh's intelligent features — at least temporarily. At this point, the desktop computer becomes a character-oriented terminal, dedicated to a single job and controlled by the host. But when a Mac is running under MultiFinder, a session with the host is just one job running in its own window. You can run multiple midrange jobs in separate windows, view them concurrently on one or more monitors, and run a native Mac application, such as a word processor, at the same time (see Figure 1). Midrange programmers, for example, can debug midrange source code in one window, watch the revised program execute in another window, and cut and paste between the midrange screens and a Mac document in a third window to create the program documentation.

The midrange system offers advantages such as advanced file-server capabilities and data safety to Mac users. The midrange security system, for example, automatically checks each user's authorization to access files or perform restricted operations. The midrange file-management system provides file- and record-locking services to prevent conflicts among multiple users as well as ensure that files aren't overwritten or destroyed. No matter how many users have access to a record, only one copy exists, so there aren't several versions of the same file. And finally, the midrange system can work as a data repository — because it's usually backed up to tape daily. This also lets Mac users archive data on the midrange system, which frees space on their hard disk.

Some Mac-to-midrange connectivity products bundle the communications link — usually an add-in board or converter box — with terminal-emulation and file-transfer software. In some cases, however, you must buy the software separately. The Mac-to-midrange connectivity products currently available are protocol converters and 5250-emulation boards (see Tables 1 and 2). Token-ring-LAN adapters are also emerging as an option.

Protocol Converters

Protocol converters are stand-alone boxes that act as translators between dissimilar computer systems. They connect to the Mac's modem port and translate ASCII communications (which the Mac understands) to EBCDIC, 5250-style, twin-axial communications, which the midrange system understands (see Figure 2). Because they require no internal hardware in the Mac, protocol converters are a practical way to connect Macs that don't have expansion slots (such as the Plus and the Classic) to an IBM midrange system. However, because they're limited

Figure 3: 5250-Emulation-Board Connection to the Host

Figure 3: When you use a 5250-emulation board to connect to an IBM midrange computer, you work at the same fast data-transfer rate as the midrange system. The board occupies an expansion slot in your Mac and connects in a daisy-chain to the midrange's twin-axial-cable network. You can daisy-chain up to seven devices to one twin-axial port.

by the Mac's modem port to a top data-transfer rate of 19.2 kbps, they're slower than other Mac-to-midrange connectivity options.

The three protocol converters currently available are the Andrew MacMidrange TwinAxcess Series II and MacMidrange TwinAxcess Series III and the Perle Model 3i ASCII Workstation Controller from Perle Systems.

Andrew's MacMidrange TwinAxcess Series II has as many as seven serial ports, which lets you attach seven Macs to the same protocol converter and reduce costs per user significantly. It's also upgradable: You can start with a single port and add more as needed. The one-port model costs $1,695; the seven-port model costs $3,595. The Series III is a nonupgradable single-port model that costs $1,295.

For terminal and printer emulation and file transfer on the Series II and Series III, you need to install Andrew's Boxer software ($150) on the Mac, and ETU must be installed on the midrange for file transfer. Boxer provides a HyperCard interface to ETU that simplifies file transfers. Boxer lets your Mac emulate up to seven 5250 terminals, each in its own window, one of which can contain a printer-emulation session.

Boxer is much better than other terminal-emulation software, because it maps 5250 terminal functions to the Mac's extended keyboard. Macintosh users who

are unfamiliar with a 5250 keyboard will find that the extended keyboard's Help key, for example, now also functions as the midrange Help key. For midrange users who are unfamiliar with the Mac, Boxer offers a pull-down, tear-off menu with icons for special 5250 command keys such as System Request and Error Reset. You can select the desired key function from this menu or request an on-screen display of the current keyboard mapping. Boxer also lets you customize keyboard mapping and tear-off menus as well as create keystroke macros to automate such tasks as sign-on sequences.

The Perle Model 3i ASCII Workstation Controller, announced as this article went to press, connects one, three, five, or seven Macs to a midrange system. Depending on the number of ports you need, the cost ranges from $1,995 to $3,495. Perle's terminal-emulation software, PerleTalk, sells for $225; you also need to have ETU installed on the midrange system for file transfers. PerleTalk allows up to seven communications sessions between the Mac and the midrange computer (one can be a printer session), and it lets you cut and paste between the Mac and midrange sessions.

Protocol converters can work with any Mac, and they can connect multiple Macs to a midrange system, but they're slow. If you need faster data transfer, 5250-emulation boards are the answer.

Figure 4: Token-Ring-LAN Connection to the Mac

Twin-axial cable

5250

PC

Token-ring LAN

Midrange system
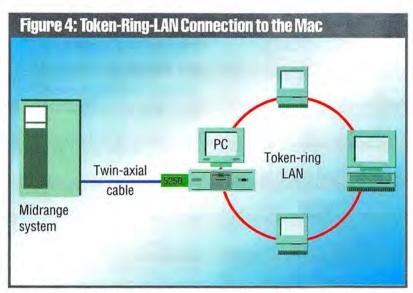
Figure 4: For speedy Mac-to-midrange connectivity, token-ring LAN adapters may be the best choice. The adapter occupies an expansion slot in your Mac and connects to multiple desktop computers networked in a ring. There's one hitch — you need an IBM PC to act as a gateway between the midrange system and the Macs on the LAN.

5250-Emulation Boards

Internal 5250-emulation boards plug in to a Mac expansion slot and provide a direct twin-axial connection to the midrange system (see Figure 3). Like protocol converters, 5250-emulation boards translate ASCII communications to EBCDIC 5250-style communications. But unlike protocol converters, 5250-emulation boards can operate at the full rated speed of the midrange connection — 1.2 megabytes per second. Andrew and IDEAssociates make 5250-emulation boards for the Mac.

The MacMidrange MacTwin 5250-emulation board is part of Andrew's Mac-to-midrange product series. It is bundled with InterAxcess software for terminal and printer emulation and file transfer (again, you need ETU on the midrange for file transfers). InterAxcess is identical to the Boxer software for Andrew's protocol converters, except that its hardware driver is different. The MacTwin board costs $995 for the SE and LC and $1,095 for the SE/30 and Mac II.

The MacMidrange NetAxcess is another 5250-emulation board from Andrew. It provides all the functions of the Mac-Twin, with a big difference: NetAxcess is a communications gateway that provides Mac-to-midrange connectivity for as many as seven Macs connected via LocalTalk, EtherTalk, or TokenTalk (collectively known as AppleTalk). You only

need to install the board in one of the Macs and simply load client software on the others. The software-only Macs can then communicate with the Mac that has the emulation board. NetAxcess, like TwinAxcess, is bundled with InterAxcess emulation software. Available for the SE, SE/30, and Macintosh II series, it costs $3,995.

IDEAssociates' IDEAcomm Mac differs from the Andrew MacMidrange products in an important way: Its bundled file-transfer software, IDEAlink, supplies both the Mac and the midrange pieces of the file-transfer puzzle, so you don't have to buy ETU for the midrange. The Mac interface to IDEAlink is an easy-to-use HyperCard stack — either your own or the one that comes with the software.

IDEAlink supports only four communications sessions, not seven, but this limitation has the benefit of limiting the number of midrange device addresses consumed by greedy users. A real constraint, however, is IDEAlink's keyboard mapping, which isn't nearly as good as that of Boxer or InterAxcess. IDEAlink maps the keys as they appear on a 5250 terminal's keyboard, so if you've never seen such a keyboard, the program may be awkward for you to use. Another limitation is that IDEAcomm Mac provides printer emulation for Apple ImageWriters and LaserWriters only. If you use any other printer with your Mac, you're out of

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BRIDGES
INTEGRATION

For some users, the productivity gained by the Mac-to-midrange connection transcends the cost.

luck. Versions of the IDEAcomm Mac board are available for the Mac SE for $995 and for the Mac II for $1,095.

Token-Ring LANs

An emerging alternative for Mac-to-midrange connectivity is the token-ring LAN. Token-ring LANs use a communications protocol that prevents network tie-ups by passing a token, or special authorization signal, among computers connected in a ring. Only the computer with the token is allowed to broadcast over the network. This means that all the computers on the network are peers and you don't have the master/slave relationship of other IBM-midrange communications methods, such as twin-axial. Token-ring LANs have another big advantage: With data-transmission rates of 4 to 16 megabytes per second, they're the fastest communications medium available.

The AS/400 and some System/3X models can attach directly to a token-ring LAN when the correct adapter card is installed. The Mac also needs a card to connect to the same LAN. Unfortunately, to connect to a token-ring LAN, the midrange must be connected to a PC rather than a Mac (see Figure 4). The midrange can connect to the PC via a token-ring-LAN adapter, twin-axial-workstation controller, or serial communications port. Although you can't directly connect a midrange computer to Macs in a LAN, it appears that software being developed by Apple will soon enable a direct connection and should make it easier for Macs and midrange computers to share the advantages of token-ring LANs.

The Bottom Line

Protocol converters, 5250-emulation boards, and token-ring-LAN adapters provide a variety of Mac-to-midrange connectivity choices. But power has its price: These options can cost $500 to $1,300 per user. Until these prices go down, evaluate your connectivity requirements carefully. For some users — such as software developers and documentation specialists — the productivity gained may transcend the costs.

Table 1: Features of Protocol Converters

	Andrew MacMidrange TwinAxcess Series II	Andrew MacMidrange TwinAxcess Series III	Perle Systems Perle Model 3i ASCII Workstation Controller
List Price	1 port, $1,695; 2 ports, $1,995; 4 ports, $2,695; 7 ports, $3,595	$1,295	1 port, $1,995; 3 ports, $2,495; 5 ports, $2,995; 7 ports, $3,495
Comments	Upgradable from one to seven ports. Requires emulation software on the Mac and file-transfer software on the midrange computer.	Single-port model. Requires emulation software on the Mac and file-transfer software on the midrange computer.	Upgradable in two-port increments. Requires emulation software on the Mac and file-transfer software on the midrange computer.
Emulation software/price	Boxer/$150	Boxer/$150	PerleTalk/$225
Host file-transfer software	ETU (Andrew)	ETU (Andrew)	ETU (Andrew)
Keyboards supported	Standard and extended	Standard and extended	Standard and extended
Printers supported	Any printer with standard printer driver	Any printer with standard printer driver	Any printer with standard printer driver
Macs supported	Plus and later	Plus and later	Plus and later
Company	Andrew Corp. 6034 W. Courtyard Dr., Suite 100 Austin, TX 78730 (512) 338-3000	Andrew Corp. 6034 W. Courtyard Dr., Suite 100 Austin, TX 78730 (512) 338-3000	Perle Systems 630 Oakmont Lane Westmont, IL 60559 (708) 789-3171

Table 2: Features of 5250 Emulation Boards

	Andrew MacMidrange MacTwin	Andrew MacMidrange NetAxcess	IDEAssociates IDEAcomm Mac
List Price	SE and LC, $995; SE/30 and II, $1,095	$3,995	SE, $995; II, $1,095
Comments	Excellent printer support. Includes terminal-emulation software; requires ETU on the midrange system for file transfer.	Provides AppleTalk access to midrange systems. Includes terminal-emulation software; requires ETU on the midrange system for file transfer.	Includes file-transfer software for both the Mac and the midrange computer.
Host sessions per Mac	7	7	4
Printer sessions per Mac	1	1	1
Emulation software	InterAxcess	InterAxcess	IDEAlink
Host file-transfer software	ETU (Andrew)	ETU (Andrew)	IDEAlink
Keyboards supported	Standard and extended	Standard and extended	Standard and extended
Printers supported	Any printer with standard printer driver	Any printer with standard printer driver	Apple ImageWriters and LaserWriters
Macs supported	SE, SE/30, LC, II	SE, SE/30, II	SE, II
Company	Andrew Corp. 6034 W. Courtyard Dr., Suite 100 Austin, TX 78730 (512) 338-3000	Andrew Corp. 6034 W. Courtyard Dr., Suite 100 Austin, TX 78730 (512) 338-3000	IDEAssociates 29 Dunham Rd. Billerica, MA 10821 (508) 663-6878

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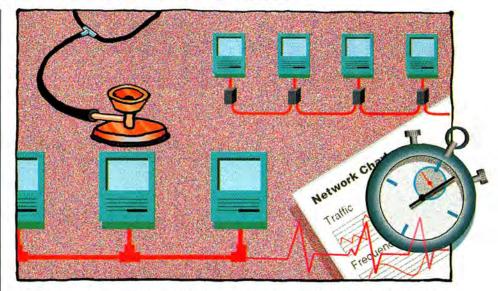
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Give your network a complete physical while it's healthy. The information you gather will help you recognize and treat network ailments.

By Kurt VanderSluis

O
ne reason network troubleshooting is so difficult is that it doesn't involve any of your senses. When a network is "sick," it looks, smells, feels, and sounds exactly the same as when it's healthy. By contrast, if your car's engine breaks down, you can usually diagnose the problem by sight, smell, feel, or sound.

Your familiarity with the way the car normally behaves makes pinpointing problems much easier. For example, you've heard your car's engine hundreds of times before, so you know what it *should* sound like. This reference point can be invaluable when trouble strikes.

Because a computer network doesn't display signs of its physical fitness, you must rely on data-gathering tools instead. To troubleshoot your network quickly and accurately, you should reach the point where the information you gather is as familiar to you as the sound of your car's engine. To gain this familiarity, use your troubleshooting tools *before* your network develops a problem. By running tests when the network is healthy, you'll have "normal" data to compare against the results you get when the network's in trouble.

For example, last month we talked about the PET (progressive echo test), which sends a signal to points progressively farther away on the internet. By seeing how long the signal takes to bounce back to your location from each node, you can locate the source of a network malfunction. The echo test produces numerical data that indicates the reliability and the speed for the round-trip echo. If an echo test tells you that a round trip to another node takes an average of .04 seconds, you need to know whether that's normal or not. If you test the network only after it breaks down, you won't have a set of normal data against which to compare the results. Therefore, you should first run the echo test while the network is healthy. By keeping records (such as the graphs in last month's article), you'll have reference points to use when things go wrong.

You should perform other preventive tests to develop a sense of what normal data looks like and think about what the information means and what it tells you about the network. In addition to the PET, there are three other sets of benchmarks you should perform, using the following troubleshooting tools:

Traffic-monitoring tools can show you how busy the network is during typical transactions. Using programs such as Farallon's Traffic-Watch or the tools that come with Farallon's StarController or NuvoTech's TurboStar, watch how the network responds when you send a file to the printer, download a file from the server, or retrieve some data from a database. If your traffic-monitoring tool can produce a "skyline chart" of traffic density over time, look at it carefully and determine what caused the peaks and valleys. Get a feeling for which network events correspond to various traffic patterns, and you'll be better prepared to interpret the patterns in case of trouble.

Packet-monitoring tools—the AG Group's EtherPeek or LocalPeek, for example, or Neon's Netminder Ethernet or Netminder LocalTalk—tell you what kinds of data packets are on the network at any given time.

BRIDGES
TROUBLE SHOTS

Packets come in many forms, containing different types of data. They convey messages ranging from "Where are the printers?" to "Are you there?" to "Here's some data." Run EtherPeek or Netminder, and watch the variations that occur when someone boots a Mac, has an AppleShare session with no activity, or receives a mail message from the server.
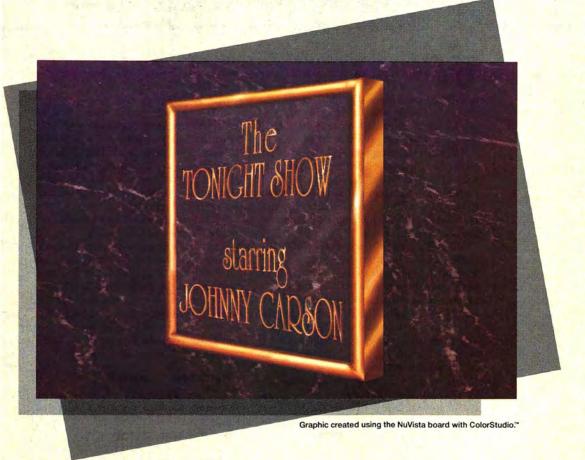
The Addison-Wesley book *Inside AppleTalk* describes all the packet formats, and if you're persistent, you can eventually understand what all that hexadecimal gobbledygook means. If you carefully study the packet patterns, you can determine when packets are missing and if there are too many of one kind or not enough of another. For example, the Mac emits a special packet when it first boots, and it should emit it only once. If a Mac is sending out this boot packet repeatedly, something is definitely wrong. If you don't use packet-monitoring tools on a healthy network, you don't stand a chance of interpreting the results when the network breaks down. Don't be discouraged by the difficulty of deciphering packets — it really does get easier with experience. There's also no better way to familiarize yourself with how a network works than by reading the packets.

Information-gathering tools such as Technology Works' GraceLAN and CSG Technologies' Network Supervisor can provide a variety of information about each machine on a network. For example, these tools can tell you what type of Mac is on a particular node and what version of the System it is using, how much memory it has available, and what INITs and applications are running. Gather this information when the network is healthy, and keep it so you'll have reference points whenever the network runs into problems.

NetAtlas, a network-mapping product soon to be released from Farallon, has a data-comparison feature that can automatically compare current network information against previously gathered data and report the differences. It notifies you if new network-ID numbers have appeared, if old ones have disappeared, if node numbers have changed, and so forth. By studying the differences, you can see which changes are normal and which aren't.

Remember, network troubleshooting involves comparing what *is* happening to what *should be* happening. Learn what data to expect under normal conditions, and you can spot problems more quickly and restore an ailing network to health in record time.

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Do-It-Yourself Mac Repairs

The author of Macintosh Repair & Upgrade Secrets *shares his top ten tips for fixing the Mac.*

By Larry Pina

When manufactured goods were scarce, every repair involved fixing, mending, and making the best of what you had. Today, manufactured goods are so modular that once you've isolated the problem, most repairs merely involve removing the suspect module and replacing it with one that works.

The Mac is no exception. As long as you use some common sense and don't try to do anything risky or beyond your capabilities, you can probably do simple repairs. Even if you can't fix it yourself, you'll save time and money by being able to identify the faulty component, remove it, and send it to be serviced.

Most of the repairs I describe concern the Mac II, IIx, IIcx, IIci, and IIfx, which are easy to open and whose components are logically laid out and fairly simple to remove and replace. These Macs all have a disk drive, a hard drive, a motherboard, and a power supply. The II, IIx, IIcx, and IIfx also contain a video card (the IIci has built-in video circuitry). Figures 1 and 2 show how the layout of the Mac II, IIx, and IIfx differs from that of the IIcx and IIci.

Before we begin, there are a few caveats. First, if your Mac is still under warranty, leave repairs to your dealer. Because the new Macs (the IIsi, LC, or Classic) are still under warranty, I don't include them in this article.

Second, several of these tips require that you send Mac components to be serviced once you've diagnosed the problem. A third-party service center may cost less than your Apple dealer (I've included typical third-party charges for some repairs), but make sure you find a reputable company. Get recommendations from other Mac users, and ask for testimonials.

And finally, although some of these repairs are easy to do, others require some technical knowledge and specialized equipment. A few rules: Don't attempt *anything* you aren't comfortable with, shut down before opening the case, and handle all components with the greatest care. Now, let's get started.

Floppy-Disk-Drive Problems

1. Good 800K floppy disks suddenly become unreadable, and you can't initialize blank floppy disks. Check to see that the ribbon cable connecting the floppy-disk drive to the motherboard is firmly seated. There's also a chance that the drive has dirty heads. You can buy cleaning diskettes from your local computer store — they look like regular diskettes except that they have a felt disk instead of a plastic one. Insert the premoistened cleaning diskette into the drive, and wait the prescribed time. [*The jury's still out* on the merits of cleaning diskettes. For a full discussion of their pros and cons — plus how to use them — see Help Folder, March '91, page 266. — Ed.]

2. You have the problem described in No. 1, cleaning hasn't solve the problem, and other floppy-disk drives connected to the same computer work fine. You (or someone else) may have damaged the heads by forcibly removing a stuck disk. You can't fix this yourself, but you can remove the drive to have it repaired.

The floppy-disk drives on the II, IIx, and IIfx are fastened to a horizontal mounting plate by a single Phillips-head screw. Unplug the data cable, remove the screw, and take out the drive. On the IIcx and IIci, this operation is not as straightforward: Unscrew the Phillips-head screw on the corner of the floppy-disk/hard-drive assembly, and remove the power supply and cables, and the two drives will pop out. Rebuilding an 800K drive (with new heads) costs about $100.

Hard-Drive Problems

3. You can't get past the Welcome to Macintosh message when you start up. This symptom can indicate that you have a corrupted Finder. Start up from a floppy containing the same versions of the System and Finder that are on your hard drive, drag a fresh copy of the Finder from the floppy to the System Folder on the hard drive, and choose Restart from the Special menu. If the hard drive boots normally, the problem is fixed. (You can also try installing a new System, using the System-installer disks that came with your Mac.)

4. You can't get past the blinking question-mark icon, and you're sure that the hard drive is spinning. Check for any SCSI problems such as an ID conflict, a termination problem, or a loose cable. To check the SCSI-ID number, look on the switch on the back of each device or use a utility such as SCSI Probe (a freeware utility available from Zmac and other on-line services and user groups). Each device should have a unique number from 0 to 6, inclusive.

When checking termination, be aware that only the first and last SCSI devices on a chain should be terminated. Some products are shipped with internal termination, however, and if you have one of these devices in the middle of a chain, you'll have problems. Check with the manufacturer to find out if a device is internally terminated. If it isn't,
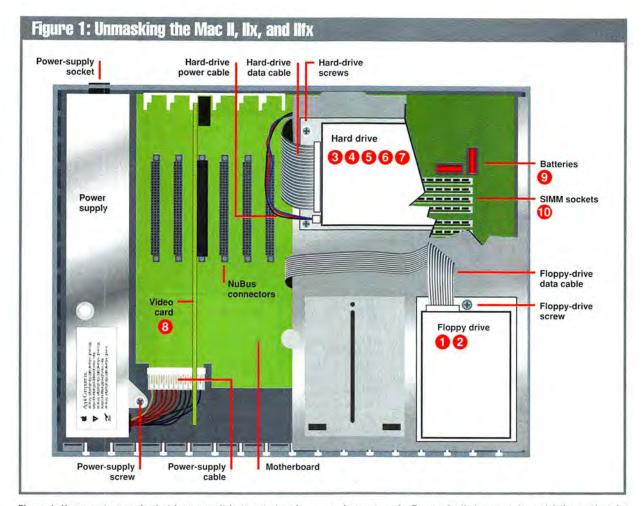
Figure 1: You may be surprised at how easy it is to get at various components inside your Mac, such as the floppy- and hard-disk drives and power supply. For repairs that you can do, match the numbers by the components with the corresponding repair tips.

check to see if there is a 50-pin flow-through terminator plug on the SCSI connector. Remove the plug if the device is in the middle of the chain; add a plug if it's the first or last device on the chain.

5. You can't get past the blinking question-mark icon, and you've ruled out SCSI problems. You may have corrupted boot blocks. First, try using a hard-disk-recovery utility such as Norton Utilities for the Macintosh to examine the disk. (For a complete guide to hard-disk recovery, see "Surviving the Crash: Hard-Disk Recovery," April '91, Buyer's Guide page 42.)

If you still have problems, your next step is to try SCSI-formatting software, such as Silverlining from LaCie or Format/Partition from NuvoLabs (don't use Apple's HD SC Setup — it doesn't have the tools you need for this job). Start up from a floppy disk containing the SCSI-formatting software. If it recognizes the

drive, there's a good chance you can fix it. Look for a menu item that verifies blocks and runs a drive test. If a dialog box at the end of the test reveals that bad blocks were found and successfully reassigned, try to mount the drive (your software may let you do this from within the program). If you're successful, you'll have solved the problem and saved most of your data. If you can't mount the drive, your formatting software gives you a couple of options: reinitializing (which overwrites the directory) or reformatting (which overwrites the entire drive and tests the blocks). You'll lose all your data if you do either of these operations, so make sure you back up your files regularly.

6. You can't get past the blinking question-mark icon, and you can't hear the internal hard drive spinning. If this happens, the bearing lubricant may have thickened or the heads may have stuck to the medium. Either way, there's a good

chance you can fix it. On the II, IIx, and IIfx, the hard drive is fastened to a metal mounting bracket by two Phillips-head screws. (On the IIcx and IIci, the hard drive isn't screwed in, so you can simply pop it out.) Unplug the data and power cables, remove the mounting screws if necessary, and briefly place the drive in direct sunlight. More often than not, a few hours of the sun's heat will thin the lubricant or free the heads, at which point the drive should work fine. A variant on this procedure is to carefully turn the computer upside down or on its side and leave it somewhere warm (about 70 degrees) overnight.

7. You can't get past the blinking question-mark icon; the drive makes strange scraping noises, the stepper motor ticks, or the drive isn't spinning, and you have reason to believe it's not a power-supply or motherboard problem. Send the whole drive module to be

Figure 2: Inside the Mac IIcx and IIci

Power-supply socket

Motherboard

NuBus connectors

Floppy-drive/ hard-drive assembly screw

Video card

⑧

SIMM sockets

⑩

Power supply

Hard-drive data cable

Hard-drive power cable

Hard drive (top)

③④⑤⑥⑦

Floppy drive (bottom)

①②
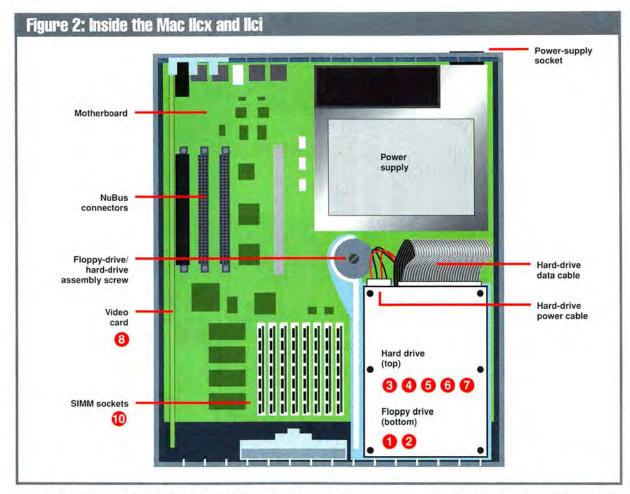
Figure 2: The inner workings of the Macintosh IIcx and IIci are similar but not identical — the IIci also includes video circuitry on the motherboard as well as room for a ROM upgrade and cache card. The numbers refer to repair tips that you can use.

repaired. Some repair shops will retrieve all or some of your data. Prices vary with drive size.

Video-Card Problems

8. You see colored blotches, static, or buzz lines on the monitor display. Find out if the monitor is in trouble. Connect it to another Mac, and see if the problem persists. If the monitor's OK, then the problem is in the video card, which is plugged into a NuBus slot. (With a IIci with no external video card, the problem may be the video circuitry on the motherboard). To remove the card, turn the power off, *wait at least 20 seconds*, and then pull straight up on the card. Component-level repair of a video card costs about $115.

Power-On Problems

9. Pressing the power-on switch intermittently fails to start your Macintosh II, IIx, or IIfx. The usual problem is a weak battery on the motherboard. On the II, IIx, and IIfx, there are two $^1/_2$ AA lithium cells located under the drive bay. (One battery powers the power-on key, and the other powers the clock and PRAM. The IIcx and IIci's power-on keys are powered by a 5-volt "trickle" line on pin 10 of the power supply.)

To test the cells, press the power-on key and read the batteries' voltage with a digital multimeter (available from Radio Shack or other electronics-supply stores for about $40). Good cells generally read from 3.2 to 3.7 volts and weak cells read from 2.3 to 3.2 volts. Any cells that fall to less than 2.15 volts are considered dead. Newer Macintoshes have a battery box that lets you simply pop the batteries out to replace them. On older Macintoshes the original batteries are soldered in, but you may be able to find a dealer who can retrofit your board with a removable battery holder.

SIMM Problems

10. You see a blinking question-mark icon or hear an error tone on startup. Immediately after their power button is pressed, all Macs run an internal diagnostic program. The more RAM you have, the longer it takes. If the Mac passes the test and there's a startup disk on-line, the computer boots to the desktop. Otherwise the blinking question-mark icon is displayed. If you hear an error tone when you start up a Mac II, it can mean SIMM problems. Test the SIMMs by replacing them with another set. Your SIMMs may be defective, in which case you need to replace them, or they may be too thick or too thin for the socket. It is possible to tighten the contacts on the sockets, but this is a sensitive operation and you need to use *extreme care*. To tighten the contacts, use a small, delicate tool such as a jeweler's screwdriver to move the contact wires closer together. ▣

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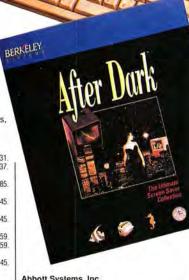
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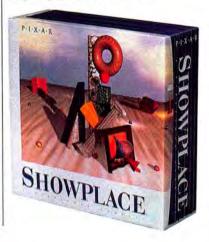
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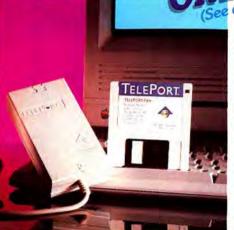
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Macintosh Classic

Applications Are Talking Too

Interapplication communication is on its way — and when it gets here, it'll change not only what applications do but also how you use them.

By Michael Swaine

When System 7.0 arrives this summer — oops, no room for *another* foot in my mouth. Let's start again.

Whenever System 7.0 arrives, its most important feature — interapplication communication — won't be visible immediately. IAC (interapplication communication) lets applications talk among themselves, and it's a juggernaut rolling toward your desktop. You won't be able to avoid it forever, because eventually your applications are going to be chattering among themselves like squirrels in the trees. The question is, when? IAC won't mean much to most users until a critical number of applications that make use of it have come on the scene.

There has been plenty of time for developers to create applications that exploit IAC, so some of them will arrive at the same time as the System 7.0 release or shortly thereafter. That doesn't mean that Mac users will immediately *have* them — unless we run right out and plunk plastic on computer-store counters or the applications we're currently using are among the first to upgrade. But it should mean that IAC will already have some momentum when it starts rolling our way.
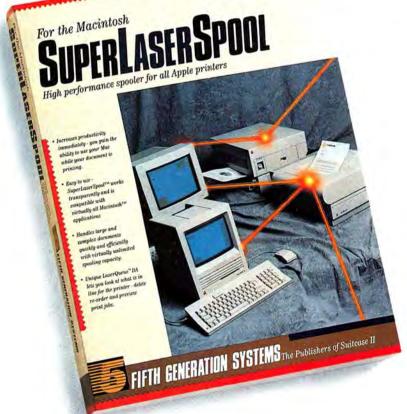
In recent months, however, things have become a little more complicated for the developers who are going to create these applications: There are now more flavors of IAC to choose from as well as competing claims to weigh. Fortunately for Mac users, these are problems that application developers have to deal with — the rest of us don't have to worry

about which IAC method is best. But the fact that we don't have to make the choices doesn't mean we won't have to deal with the consequences. The choices developers are making will matter to us because different IAC approaches are not all compatible, and incompatible communications methods generally mean no communication at all. So maybe it wouldn't hurt if we knew a little more about IAC.

Exactly what, the pragmatic Mac user is justified in asking, is interapplication communication going to do for me? Speaking as an occasionally pragmatic Mac columnist, I see IAC as a prerequisite for two developments we can expect to see in computer software over the next few years: collaborative computing and more-focused applications. Both developments address real and growing problems of managing the increasingly complex tasks that can be done by computers and dealing with the proliferating tools we use in performing these tasks.

The Power to Point

Collaborative computing means people working together, via computers, to achieve a common goal. It's nothing new, really, but what *is* relatively new are some of the ideas for making collaboration easier. For example, we need a more robust way to share information than what we currently have. What we *have* is the Clipboard, which allows us to pass around copies of information chunks. What we *need* is to be able to share the actual chunk, not copies

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BEATING THE SYSTEM

A decade of experience with 'integrated' applications should convince anyone familiar with software that a jack of all trades rarely masters any.

of it. This is crucial, because not all "copies" are identical — one copy may have been edited, for example — so when collaborators talk about a chunk of information, they may not be talking about the same chunk. Collaboration is always performed *on* something, and the collaborators need to be able to point to that thing itself.

System 7.0 satisfies this collaborative-computing prerequisite by allowing documents to incorporate links to shared chunks of information. There are different ways to implement such links, but Apple's model is Publish and Subscribe. In the Publish and Subscribe model, a chunk of information in one document can be marked as a "publication" and many documents can "subscribe" to it. The publication can be incorporated smoothly into each subscribing document as though it had been generated there, and when the publication is changed, it changes in each subscribing document. These changes occur because the subscriber has a link to the original, *not* the original itself.

Death of the Creeping Feature

The second important benefit that IAC will provide is a trend toward more-focused applications. This comes down to the issue of the specialist versus the generalist. Every Mac application is — or ought to be — an expert in some domain. A decade of experience with "integrated" applications should convince anyone who's familiar with personal-computer software that a jack of all trades rarely masters any. But most Mac applications don't stick to their individual areas of expertise. Communications packages have full-featured editors, spreadsheet programs draw graphs, and word processors evaluate numeric expressions. Why is this creeping-feature syndrome happening? Because we, as users, demand it. We need to access our address books while we're using communications programs, insert the results of computations into letters, see data in a different way — and these real-world

problems often slop over the nice boundaries of an application's area of expertise.

Integration of software functionality is the problem, but creeping features aren't the solution. For most people, integrated software isn't the solution either. This is because, again, the tool we now have is the Clipboard, and again, it's not what we need. The Clipboard lets you move data to the application where the desired function resides. But often what you *really* want to do is move the function to where the data is. You want to stay where you are and have number crunching or graphing come to you. You want to work "in place."

With AppleEvents and low-level IAC, two of System 7.0's IAC capabilities, you can do that. (Or you will be able to do that when applications that use these system capabilities are released.) One application can draw on the expertise of another, so that each focuses on its area of expertise, calling on other applications for capabilities outside its specialty. You can adopt a surgical approach, requesting just the precise instrument you need to operate on the patient in front of you, rather than making do with hairpins for clamps or continually wheeling the patient from operating room to operating room.

Apple's IAC Instruments

Publish and Subscribe, AppleEvents, and low-level IAC are System 7.0's IAC tools. Publish and Subscribe is intended to be nearly as ubiquitous as Copy and Paste. It's universal IAC. AppleEvents is the protocol that manages how applications send messages to each other. It's intended to be the generic IAC for the Macintosh, and any applications that want to get in on the conversations are supposed to talk AppleEvents.

Low-level IAC is a set of tools for developing more-specialized IAC abilities. Unlike AppleEvents, its protocols are not standardized by Apple, so its most obvious use is to give a third-party company's product line an edge by making its applications communicate better among themselves than they do with other vendors' applications. This is called proprietary IAC.

None of these IAC capabilities are here on a grand scale yet, because System 7.0 is not here yet. The delays have lessened the potential impact of this significant upgrade of the Mac's operating system. The notions that everyone will shortly be using System 7.0 and that the problems presented by the 2-megabyte minimum-memory requirement for System 7.0 would somehow

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The big news from January's Macworld Expo was Excel 3.0, and the big news about Excel 3.0 was OLE (object linking and embedding) — part of Microsoft's approach to IAC.

magically go away have proved to be wishful thinking. When System 7.0 arrives, System 6.x will not immediately sidle off the stage.

While System 7.0 has been slouching birthward, two higher-level approaches to IAC on the Mac have sprung up.

Strange Embedfellows

The big news from Microsoft at January's Macworld Expo was Excel 3.0, and the big news about Excel 3.0 was OLE (object linking and embedding). OLE is part of Microsoft's approach to IAC, developed for PCs running Windows and now ported to the Mac.

Microsoft has implemented its IAC identically on the PC and the Mac so that IAC links among documents work across platforms. You can, in principle, link an Excel spreadsheet and a Word document on the Mac and move the documents to a PC, and not only will Excel and Word on the PC be able to read the documents but the link will work too.

I say *in principle* because at the moment only Excel supports OLE. However, other Microsoft applications on the Mac and PC will use OLE. Not only that, so will applications from other developers, because Microsoft is making its protocols public.

Microsoft's IAC is not Apple's IAC — but it is also not a proprietary IAC. Microsoft has implemented document linking in a way that differs from Apple's Publish and Subscribe approach not only technically but also at a level that will affect users. Developers have the option of using either the Microsoft or the Apple version of IAC. The Microsoft option has some attractions, particularly if you have Mac and Windows versions of a given application. It does muddy the waters, however, and the programmer interface won't be available until later this year.

There is, however, another high-level approach to IAC on the Macintosh that is

currently available, is AppleEvents-compatible, and promises a Windows version in the not-too-distant future.

IAC Here and Now

The IAC Toolkit from Palo Alto-based UserLand (well-known Mac developer Dave Winer's latest venture) widens the field of choices, and Winer has beaten Apple and Microsoft to the punch. Although IAC Toolkit is currently a Mac-only product, the head developer, a Windows-programming veteran, has been charged with porting it to Windows.

The UserLand IAC Toolkit works with System 7.0 or the current System 6.x. To use it with System 6.x, all you have to do is put an INIT into the System Folder. The IAC Toolkit is a collection of routines programmers can add to their applications. These routines let applications send messages and respond to messages from other applications. Because it offers a higher-level approach than working directly with Apple's tools, it should speed development of applications that will exploit IAC.

One of the unanswered questions about IAC is just what it will look like to users. The UserLand product doesn't really answer that question, but it gives us a few hints. In principle, the user interface for all of IAC (except for Publish and Subscribe) is up to third-party developers. In practice, Apple will no doubt provide examples in the form of applications from its software subsidiary, Claris.

Eventually there will probably be a user scripting language that lets you control applications precisely. What that language may look like is unsettled; it may have HyperTalk-ish syntax, or it may look more like batch-command files in DOS. There will probably be more than one such language. UserLand is working on one, which it hopes to bring to market this year. The IAC Toolkit has been designed throughout with scripting in mind.
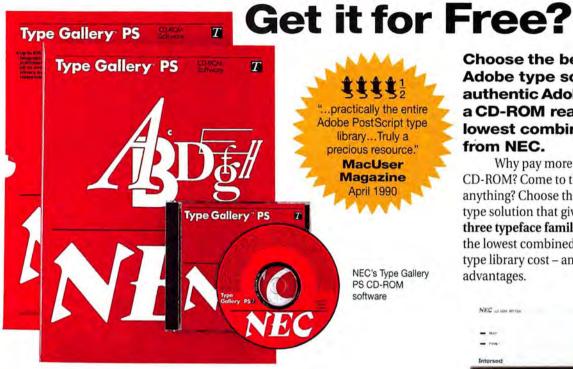
But It Was Here All Along

One Macintosh tool that has supported IAC since 1987 is HyperCard. Individual HyperCard stacks have always been able to send messages to other HyperCard stacks. This was of limited usefulness before HyperCard 2.0, because only one stack could be open on a machine at a time and a stack couldn't easily communicate across networks.

Version 2.0 breaks the first barrier, and HyperCom, from Gava, of Seattle, breaks the second. With HyperCard 2.0, you can easily have two or more HyperCard stacks

BEATING THE SYSTEM

With HyperCard 2.0, you can easily have two or more HyperCard stacks on numerous machines on a network messaging one another and accessing each other's functionality.

on numerous machines on a network messaging one another and accessing each other's functionality. (A To Do stack, for example, might tell a database to update itself.)

HyperCom is a set of external commands and functions for communicating between stacks across an AppleTalk network. It was available for HyperCard 1.x, but HyperCard 2.0 makes it really useful. HyperCard 2.0 lets you have more than one stack open in separate windows and runs in the background under MultiFinder. It has performance enhancements that make interstack communication more powerful.

Chiefly, HyperCom adds a Tell command to HyperTalk. You use this command by typing `tell xx yy`, where `xx` is the name of a stack or list of stacks and `yy` is a HyperTalk command or message. HyperCom sends the command or message to the stack(s). HyperCom also includes functions for getting values back from stacks. You can, for example, send an advanced mathematical expression to a stack that does symbolic differentiation and get the answer back.

A data-entry or -editing screen on one machine can trigger a database stack (possibly on another machine) to update itself. With a little care, you can set up data-entry

or -editing stacks on several machines that all access the same database. (Note that there are some thorny problems in multiuser databases that may not be adequately addressed by HyperCom. Gava says nothing about multiuser databases, and I present the example only to show that it is possible for moderately sophisticated users to explore some of the uses of IAC right now.)

HyperCard 2.0's multiple windows and background processing let you open a window on another machine off-screen while leaving the current window open. Your access to another user's machine, in other words, can be transparent (except for the performance degradation). That sounds as if it might lead to problems, but you can lock out other users from your stack or turn off HyperCom entirely. Then access to your stacks is possible only if you grant permission.

HyperCom and HyperCard 2.0 certainly make it feasible to do some tricky things. But is this really IAC? You bet. HyperCard stacks are applications, and different stacks communicating with one another does constitute IAC in the limited world of HyperCard-generated applications. And after all, Microsoft-style IAC will work only in the limited domain of Microsoft-compatible applications.

Transition

This is my last Beating the System column. Next month I'll be migrating toward the front of the magazine and into a different format. Bob LeVitus will be moving into this space. Having written a book on System 7.0, Bob has a lot to say about Mac system software. As for what I'll have to say, we'll see. Through Beating the System and my Card Tricks column, which preceded it, the back of *MacUser* has been very good to me. So have you. Thanks. See you up front.

Puzzle Answers

In honor of my last appearance in this space, here are the answers to some recent puzzles. The smallest number of steps in which the disk of September's puzzle can be optimized is 12, and yes, this is the worst case. The MITS documentation writer I alluded to in October is David Bunnell, whose best-known connection to the Macintosh is that he founded the first Macintosh magazine, which I'm pretty sure is still being published (it's known around these parts as "Brand W"). The solution to February's puzzle hinges on knowing that the chord

that the Macintosh plays when it starts up is diagnostic: If certain notes are missing or are played in a certain sequence, this provides clues to hardware problems, such as bad RAM.

The lucky winners of "I Beat the System" T-shirts are Hiroshi Yonamine, Tokyo, Japan, and Kevin Mark Eberhart, Atlanta, Georgia (September); James P. Connell, Hamel, Minnesota (October); Ben Hallert, Eugene, Oregon, and Nikki Johnson, Yarmouth, Maine (November); and Bill Vernon, Odessa, Texas (February).

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INTELLIGENT RESOURCES

Living with Murphy

Disk drives can be finicky beasts, and Murphy's Law is always ready to prove it — at the most awkward moments, of course.

By Thom Hogan

The world isn't very kind to someone in a hurry, and when computer equipment is involved, you can bet that good old Murphy is sneaking up behind you, ready to pounce.

Case in point: I had a lot of work to do when the holidays rolled around and made a mess of my schedule. Although I hate mixing travel and work, I didn't have much choice this time. I had columns to write, books to complete, a software manual to edit, and other work to finish before the end of the year. No problem, I thought. I'll just rent a Mac Portable to carry on my travels. (Although the thought of lugging 15 pounds around for two weeks didn't make me happy, I consoled myself by remembering that my first portable computer, an Osborne 1, weighed 28 pounds — at the time I thought *that* was a godsend. Of course I was younger and stupider then.)

My first mistake — which gave Murphy plenty of time to sneak up behind me — was to rent the Portable the day before I left. My second mistake was to wait until that evening to transfer work from my hard-disk drive to the Portable's internal hard-disk drive. Murphy was now leering over my shoulder. My third (and fatal) mistake was to assume that this would be a breeze. Pop! — Murphy's Law just took effect.

Sure enough, I connected my hard-disk drive to the Portable and pressed the Escape key to wake the computer up, and a few seconds later it crashed. A quick attempt to restart the Portable and boot from my hard-disk drive also failed. With three hours left before my flight, I began to panic. I unplugged my hard-disk drive from the Portable and reconnected it to my Mac II, which didn't recognize it either.

Time Out for a Lecture

About now you're probably thinking that all I had to do was pull out my backup disk and restore the hard disk. OK, that's sort of what I did, as you'll soon find out. But time-out for a lecture first. Something was doing a pretty good job of destroying the integrity of my hard disk. It might have been the Portable, or it might have been the hard-disk drive. But let's not allow Murphy to get a full nelson on us. Think about what might happen if your backup files were trashed by the same kind of phantom. That would leave you in a fine mess, wouldn't it? So here's the lecture.

I have two rules regarding backups, and these should be followed as closely as a monk follows his vows:

1. One backup is not enough. Backup disks can — and do — get zapped from time to time. I've had floppies die in storage or be zapped by the computer I was trying to restore. And, of course, there are fires, floods, theft, and other fabulous facts of life to worry about. (By the way, if you haven't figured out that last month's column was a hoax, I should tell you that Lemon Pledge isn't going to resurrect your data either.)

One thing isn't a hoax: Data is expensive to recover. I know because I've had to re-create two books, several fonts, and several other data

I've solved problems before by junking the equipment in question, but my bank balance told me I wouldn't be able to buy my way out of this one.

files from the remnants of my backup disks. Always keep a second set of backup disks of your valuable data, and keep it in a different location than the first set. If your first attempt to restore your system destroys your backup, you still have a chance to retrieve your data. (Hint: Do the second restore on a machine you know is good.)

2. Never use your backup disks until you know what's wrong with — and have fixed — the system. In the case of my trashed hard-disk drive, this meant not trying to restore the drive until I knew what had caused the original crash or until I'd reformatted the drive and tested it enough to know that it was functioning properly. If you jump in with your backup disks before you've isolated the problem or stabilized your system, there's a good chance of losing the data on your backup disks.

Meanwhile, Back at the Mac

Three hours is not a lot of time in which to fiddle with a 200-megabyte hard drive, but I pulled out my usual set of fiddling utilities anyway. My hard-disk drive is set up with several utilities that supposedly make it easier to restore it in case files are accidentally erased. Symantec's SUM II has an INIT that provides duplicate information to help you restore a drive with bad sectors, missing file links, and so on. Central Point Software's MacTools Deluxe has a similar utility, which I had been using on my drive.

Unfortunately, these utilities didn't do me any good in this situation, although I'll continue to use them in the future. The problem was that the System wasn't recognizing the drive, so I couldn't even get to the MacTools utility. (Catch 22 lives — as Mac users frequently observe.) But here's the strange part, which makes me wonder how much I can trust any of the current hard-disk utilities on the market: When I tested the drive with three disk-recovery utilities (the two mentioned above and Microcom's 911 Utilities), I got three

different diagnoses. MacTools couldn't find the drive at all. SUM II diagnosed the problem as a corrupted directory and suggested formatting the drive and forgetting about the data on it. 1stAid (which used to be called Disk 1stAid and is now part of 911 Utilities) told me that it had found one file whose sectors weren't linked correctly but that the drive and all the files except one could be recovered to floppy disks. I didn't have Norton Utilities for the Mac, but I have no doubt that it would have reported yet a different problem.

Which utility was right? Despite 911 Utilities' mediocre performance in April's lab report (see "Surviving the Crash: Hard-Disk Recovery," Buyer's Guide page 42), it is my most trusted Mac file-recovery utility. Sure, it has a terrible user interface and is difficult to understand, but in five years of use, it has never let me down on any hard-disk problem I've encountered.

Because 1stAid told me it could recover files to floppy disks, I decided to take the time to restore any file I had changed during the previous week. I was pretty sure I had backed up all these files in their current form, but it couldn't hurt to be sure. With that done, there were only two hours left before my flight, and I was getting grouchy and a bit panicky. I didn't want to risk plugging my removable-cartridge drive (which I use for backups) into the Portable, nor did I want to reformat my hard disk until I had more time to diagnose what was wrong. So I took the painful — but safe — route. I copied the files from the external cartridge onto floppies in my Mac II and then copied the floppies onto the Portable. Besides the slow read/write speed of the floppy drives, another hindrance was that my Mac II is an original with 800K drives.

This painstaking method is almost guaranteed to work, and when you're staring a deadline in the face, it's not a good time to start gambling. Moreover, by taking the floppies with me, I now had a backup of the files for the Portable. By the time I had to leave for the airport, I had the Portable's hard-disk drive set up with most of my work as well as a set of floppies to use if I still had problems.

The Diagnosis

Ironically, I no sooner got to my destination than I got sick. So I did very little work during the vacation, but I did catch up on my sleep. Being sick at the same time as my Mac didn't put me in a particularly good mood. Besides being even further behind in my work, I still hadn't

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diagnosed the hard-disk drive's problem. I've worked around such problems before by simply junking the equipment in question and purchasing new stuff. This is a great way to keep up with the latest and greatest hardware, but it isn't easy on the bank account. A look at my bank balance told me I wouldn't be able to buy my way out of this problem, so I started looking closely at the Portable and the hard-disk drive in question.

The Portable seemed to be fine — it recognized everything else I hooked up to it. When I returned it to the rental store and told the people there my problems, they did a complete hardware checkup too. No smoking gun at that end.
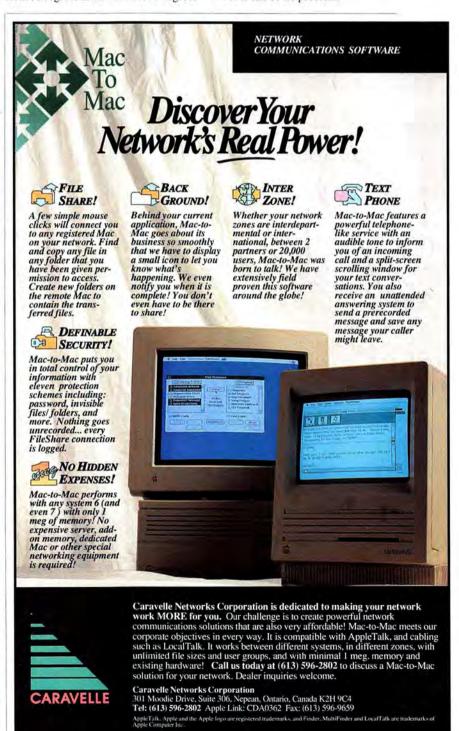
So it had to be my hard-disk drive, right? Thinking back to the last few months of hard-drive use, I remembered two symptoms I had previously overlooked. About a month before the crash, the hard-disk drive had consistently failed to load Adobe Type Manager and had displayed some unusual (and never repeated) alert boxes. On two occasions, my Mac II had crashed just after saving a file, which was also quite unusual, because most application-caused crashes are triggered by things such as launching DAs or printing. I began to wonder if something on my hard-disk drive had slowly become a problem and had eventually pushed the unit over the edge.

I'll never know for sure, but because ATM was the one file 1stAid couldn't recover, I suspect that it was the unlucky file that ended up in the drive's problem sector. My best guess is that the sector containing the ATM directory information was failing (which explains why ATM wouldn't load) and that it eventually failed completely. This may be why SUM II found directory damage. Moreover, an error in the directory section of the hard drive would likely upset the System, which explains why the disk wouldn't boot and the Portable couldn't recognize it.

Now comes the tougher part — figuring out *how* that problem had begun and *why* it eventually reared its ugly head. I'd used this hard-disk drive for almost 18 months without having to reformat it, which may have been part of the problem. Hard-disk drives drift over time. Think about the close tolerances necessary in order to stuff all those megabytes onto small platters that may be only 3.5 inches in diameter. We're talking fractions of millimeters separating tracks. As with any mechanical device, constant use can eventually loosen a hard drive's mechanism sufficiently so

that there is a measurable difference in where tracks are being written on a disk. Temperature changes can also play a part by causing the mechanism to expand and contract (my office temperature ranges from 60 degrees in the winter to 95 degrees

in the summer). The net effect is that the drive's heads may try to place and read tracks at slightly different positions on the platter as the drive ages. This can be a major problem, as I suspect it was for me — or it can be no problem.

One thing IBM PC users have that Mac users don't is sophisticated disk-drive utilities. A utility called SpinRite II automatically looks for track drift and marginal sectors. It can reformat the entire track in question on the fly, without affecting the underlying data. Others, such as Disk Technician Pro, test exhaustively for marginal sectors — the ones that are causing retries but are not yet bad enough to make the write process fail completely. Why utilities such as these haven't appeared for the Mac is a puzzle to me. Maybe we Mac users aren't as technically oriented as the average PC user (hah!). Whatever the reason, as our drives age, we are going to experience the unfortunate results of not having nearly enough early-detection software available.
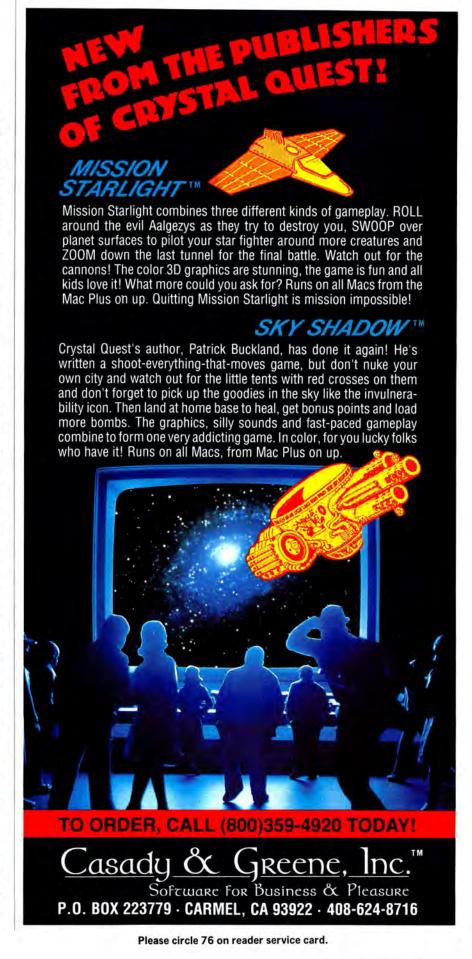
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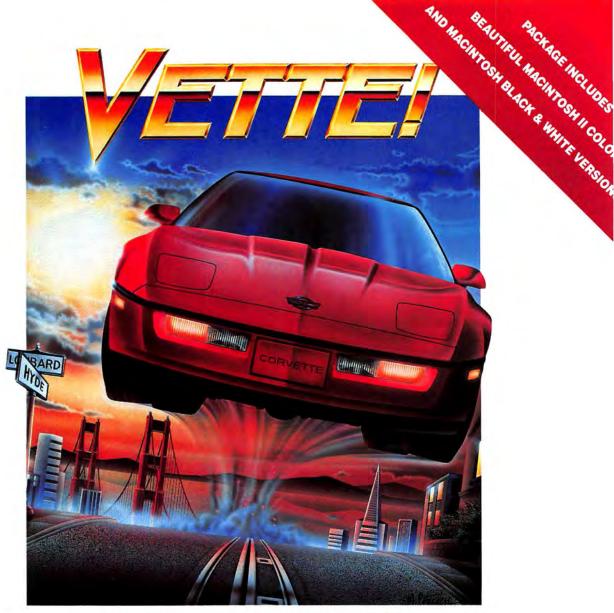
Fortunately, you can do a few things to prevent such problems — reading last month's hard-disk-recovery lab report is a good place to start. Here's another heavy-duty prescription, which you aren't going to like but should go a long way toward preventing disk troubles. Once every six months, back up your entire hard disk, reformat it with the low-level formatting utility that came with the unit, and restore it file by file. This isn't a fast operation — it takes longer to format my 210-megabyte drive with this method than it does to back up the files on it. But afterward, the hard-disk drive's sense of where the tracks are supposed to be is totally in sync with where they actually are. An hour of pain can give you a month of problem-free operation.

Here are Dr. Thom's recommendations:

1. Make a complete backup of your files.

2. Get out the hard-disk drive utility, and reformat the drive.

3. Run a test of the drive if you have the appropriate software (SUM II, Norton Utilities, 911 Utilities, MacTools Deluxe, or the drive's own utility).

4. Install a fresh System on the hard-disk drive from the disks supplied by Apple.

5. Add your System enhancements, font files, DAs, and other goodies.

6. Restore your applications.

7. Restore your data files.

These seven steps can help your hard-disk drive operate at its best level, plus they optimize the files for faster performance. And following these steps may mean that — if you're lucky — you can give Murphy the slip.

How to Hire a Programmer

Got a great product idea but can't program your VCR, let alone a Mac application? Here's how to find the technical help you need.

By Kurt W. G. Matthies and Thom Hogan

Programming is a specialized art form, requiring the practitioner to have analytic as well as synthetic skills. Only those people who can think logically and have an eye for detail (as well as a constitution that thrives on all-night sessions) can achieve any measure of success.

Programming is not a career for everyone, yet we all get ideas for products we're sure would make us millionaires if we could somehow bring them into being. Many of today's large software houses were built on a single product. It's a continuing trend — just thumb through this magazine, and you'll see plenty of new companies marketing only one product. These entrepreneurs could well be the Farallons, MacroMinds, or Passport Designs of tomorrow.

Even if you aren't a technical wizard, you need only two things to get started in this business: a great idea and the means to bring it about. If you've been blessed with a bulging bank account, you can live out your entrepreneurial fantasy by hiring a programmer. But before you do so, here are a few things to keep in mind.

Creating the Specs

First, you must ask yourself what problem your program solves. Whether an application formats a paragraph of text, calculates a formula, or sorts a list of names, it solves some basic problem. By defining the problem — and therefore the program's focus — you define its actions.

Your first design step, then, is to write a program description, which is a consolidation of all your ideas. It should describe what the program does, how it benefits users, and who will use the product, and it should provide a general idea of how they'll use it. The program description serves two main purposes. First, you can use it to orient your programmer to the program's technical goals. Second, you can use it as the basis of a business plan. For this reason, it should be free of implementation details and technical jargon.

The next step is to define what the program will look like. This is the functional-specification phase, in which you design the program's user interface. You're the expert in this phase — no one knows your product better than you do — so there's no point in hiring a high-priced programmer yet. Bear in mind, however, that your programmer will use the functional specification to implement the design, so it must contain detailed information about every aspect of the user interface.

Designing the interface is perhaps the most enjoyable part of software creation, but a word to the wise: Keep it simple. Your first task is to come up with a basic feature set that will support your concept, but don't build in too many bells and whistles the first time around. This approach gives you a better chance of actually getting your program *done*, which is no small feat.

If this is your first program design, there are a couple of books you should read. *The Macintosh Human Interface Guidelines*

(Reading, Massachusetts: Addison-Wesley, 1987) explains the proper use of the Macintosh's various user-interface tools. Another good and informative book is Apple's *Programmer's Introduction to the Macintosh Family* (Reading, Massachusetts: Addison-Wesley, 1988), which outlines the implementation details involved in programming the Mac and is a good way to learn how to speak a programmer's language.

At this stage, you'll need a painting or drawing program to create dialog boxes, menus, and windows. Or you can use a specialized program such as Bowers Development's AppMaker or Smethers-Barnes' Prototyper, which has these standard user-interface items built in. When designing Tycho Tablemaker, we used a combination of MacDraw, MacPaint, and Prototyper.

A good place to start your design is with the windows. Anything the user sees should be defined here. Does the application require multiple views? If so, all the application's windows should be defined in this specification. If there is printed output, then reports should be part of the functional spec.
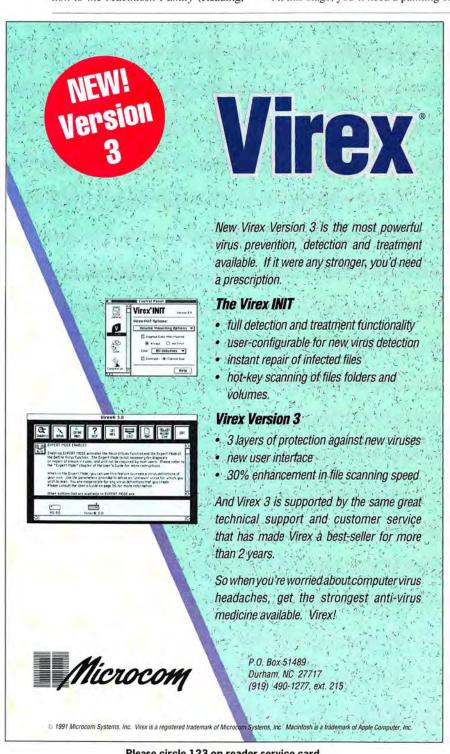
The next step is to develop a detailed description of the application's feature set. Taking a menu-by-menu approach helps you cover all the bases. Define each of the application's menus, the items for each menu, and any dialog boxes or other actions that occur as the result of a menu selection. Describe each action.

Where to Look

With the functional design finished, you're ready to find a programmer. Where do you start looking? Your best bet is to ask colleagues for recommendations. If you're the kind of person who wouldn't go to a doctor or hire a plumber without a recommendation, then it seems foolish to trust your future business success to an unknown quantity.

Another good option is to try your local Mac user group (which is where we met each other). Most user groups have a programming SIG (special-interest group). Go to a meeting, stand up and announce your needs (at an appropriate point!), and don't be surprised if you're the center of attention during the break. You can find your local user group by calling Apple's customer-service line at (800) 538-9696, ext. 500.

If the personal approach doesn't work, there are a number of professional membership organizations to try. The MCN (Macintosh Consultants Network) is an organization of programmers who specialize in Mac software development, databases, networking, and systems integration. This group is based in the Seattle area, but it has more than 100 members around the country. You can reach MCN at (206) 453-2729. Another group, the APX (Apple Professional Exchange), should have a consultants directory available by the time you read this. Contact APX at (408) 980-1957.

You can also find technical help through the classified section of your local computer tabloid. Many cities — such as St. Louis; Chicago; and Washington, D.C. — have local computer newspapers. The San Francisco Bay Area has two: *Computer Currents* — which also publishes in Southern California, Boston, Atlanta, and Texas — and *MicroTimes*. Many consultants advertise in these magazines; they're usually listed by specialty at the back.

Cut Out the Middleman

In some cities, you can use headhunters to find a programmer. Often called contract brokers, they specialize in knowing the local technical talent and their specialties. The better brokers understand the technical side of this market and can usually match you with a good programmer.

Finding your programmer in this way has major disadvantages, however. The three-way business arrangement among entrepreneur, contract broker, and programmer can create some unique problems — the size of the contract alone might scare you away. Most entrepreneurs hold contracts with the broker, who employs the programmer. The legal arrangements regarding who owns what technology can become horribly complicated. It also costs you more to hire a programmer through a broker: Instead of a one-time fee for finding the programmer, the broker may ask anything from 20 to 50 percent of the programmer's hourly rate. Because brokers receive a commission for the entire period the programmer works for you, their services can quickly become very costly. But perhaps the greatest disadvantage to using a broker is that having a middleman involved can get in the way of establishing a close, long-term relationship with your programmer.

OK, so you still haven't found a programmer. It's now time to place a classified ad in the help-wanted section of the Sunday paper. List your ad under Programmer (not Data Processor or Engineer), and run it for two or three consecutive weeks.

Where you place your ad is often more important than *what* you say. In our experience, programmers are creatures of habit and read only certain papers. For example, in the metro Denver area, where Kurt lives, most programmers check out the *Denver Post* or the Boulder *Daily Camera*, but they usually skip the *Rocky Mountain News*. Likewise, in the San Francisco Bay Area, Thom's home turf, your best bet is the *San Jose Mercury News*, which covers Silicon Valley. If you're located in another area, look through the classified section of your Sunday papers and see where others are advertising for programmers.

Just remember: There are plenty of unemployed programmers out there. However you find the right one for you, *always* ask for references from former clients. And the best of luck with that great idea of yours. ⌨

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You can also contribute tips electronically via Zmac, the on-line service for MacUser. Send them to Gregory Wasson at 72511,36. Be sure to include your full name and mailing address along with the text of the tip.

Compiled by Gregory Wasson

Control Panel

If you use a Mac with more than one monitor, here is a way to select which monitor you want to use as the main one for the Welcome to Macintosh dialog box or a Startup screen. Choose Monitors from the Control Panel, and hold down the Option key. When the Happy Mac appears, drag it to your main monitor and reboot.

Chris Rendall
Appleton, WI

Adobe Type Reunion

I like Suitcase II's ability to display fonts on the Font menu as they really appear. But after installing Adobe Type Reunion, I was disappointed to find that the feature apparently no longer worked.

To temporarily regain the feature within the application you're using, hold down the Shift and Option keys while selecting the Font menu. This key combination disables Adobe Type Reunion long enough for you to see what the fonts look like.

Larry Mendenhall
Urbandale, IA

Adobe Illustrator 3.0

Certain characters in the Adobe Symbol font, such as π and ∂, are accessible within other Adobe fonts such as Helvetica but are not displayed on the keys (you can see what keys to use via the Key Caps DA). Although you can see these characters on-screen in Illustrator 3.0, some of them don't print, even if you import text containing these symbols. If you need these characters and can't — or don't want to — switch to the Adobe Symbol font (within which they will print), here's a simple workaround. First make sure you have Adobe Type Manager 2.0 installed. Then with the new

What you type in:
    Helvetica$\pi\Omega\Delta\geq$

What prints:
    Helvetica

What you see with Create Outlines:
    Helvetica$\pi\Omega\Delta\geq$

What prints:
    Helvetica$\pi\Omega\Delta\geq$

Figure 1: Illustrator 3.0's Create Outlines command lets you print characters that don't normally print.

Create Outlines command on Illustrator 3.0's Type menu, select the text and choose Create Outlines. By selecting Preview Selection from the View menu, you can see how the text will look when it is printed. The only drawback is that the characters may look slightly bolder when they're printed (see Figure 1).

P. Michael Hartman
Franklin, PA

QuarkXPress 3.0

Here's a quick tip on importing Word 4.0 documents with style sheets into QuarkXPress. When you import text by using the Include Style Sheets option and the Word document's styles have the same names as those in the QuarkXPress document (for example, Body Text), the QuarkXPress styles should override the Word styles. However, this won't work consistently if you've saved your Word text with the default Fast Save option — only some formatting will take effect. To make sure the QuarkXPress styles do override all the Word

Tip of the Month

General

If you are using a single-floppy-drive-only system, the hassle of switching disks while a program launches or executes can drive you crazy. You can avoid this if the application you need to use is smaller than about 500K.

Because you don't need the Finder file for the Mac to run properly — it simply lets you launch other applications much more easily — you don't really need it on your startup disk. You do, however, need an application for the Mac to launch on startup, which you can provide by replacing the Finder file with the application you want to use. Here's how to do it:

1. Place a copy of the System file on an empty floppy disk (you need to use only the Minimum System version).

2. Using Font/DA Mover, remove any unwanted or unnecessary fonts and DAs from the System file. (Don't remove the Control Panel DA, however.)

3. Back in the Finder, copy the application you'll be using onto the floppy with the System file (make a System-file disk for each application you intend to use). Select the copied application by clicking on it once.

4. From the Special menu, select Set Startup. The dialog box should already display the application you've selected. Click on OK.

You're set! You can now restart your system from the floppy you've created, and your application will launch. Be sure to quit your application when you've finished. A dialog box will appear, telling you that the Finder is busy or damaged. Click on Restart in this dialog box; the disk will eject and your Mac will restart.

Kyle J. Smith
St. Cloud, MN

Aachen
Alison
Avant Garde
Baskerville
Berkeley
Bodoni
Bookman
Caledonia
✓ **Chicago**
FreshScript
Futura
Galliard
Garamond
Helvetica
Italia
Janson
Kabel
Los Angeles
Lubalin Graph
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New York
Optima
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San Francisco
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Zapf Dingbats

Chicago to Versailles. Nonstop.

Here's an open and shut case for taking the most direct route to your fonts and desk accessories. Get Suitcase II™ and store them in suitcase files, not in your system file. You'll speed up your moves and avoid stopping off at the Font/DA Mover.

Each suitcase can hold up to 500 font size and style variations, 52 DAs, or any number of FKEYs or beep sounds. And you can have up to 99 suitcase files open and accessed at once.

Suitcase II lets you store printer and screen fonts in the same folder, a great time saver, and a convenient way to share fonts on a network. You get unlimited access to DAs from your Apple menu or Suitcase II list. And you can even display the fonts in your font menu in their own typefaces.

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Fifth Generation Systems, Inc.
10049 N. Reiger Road
Baton Rouge, LA 70809
Technical Support: (504) 291-7283

Fonts not included in program.

Please circle 105 on reader service card.

BUSINESS CARD

JoAnna Smith

123 North Street, Anytown, U.S.A.
(123) 555-9887
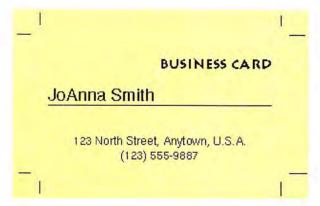
Figure 2: It's possible to create your own crop marks in QuarkXpress 3.0 when you can't use the automatic-crop-marks feature (above). Combining several grouped text objects with crop marks on one page can save money and time in imagesetter jobs (right).

styles, use the Save As command when saving your documents in Word. You can also use the Commands option from the Edit menu to add the Fast Save Enabled command to a menu. This lets you toggle Fast Save on or off as you need it.
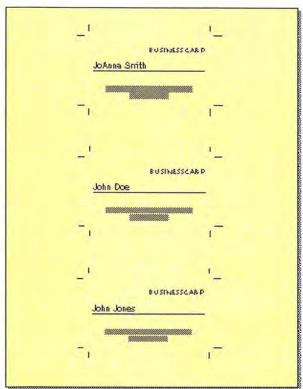
Elisabeth Nelson
Greenville, SC

If you're outputting files at a service bureau that charges per page, you can consolidate space and reduce costs by combining several small jobs such as business cards onto a larger page. However, because you are putting several separate documents onto one page, you can't use QuarkXPress' automatic-crop-marks feature. Here is the best way I've found to quickly create accurate crop marks for each document on a page:

1. Draw a text box within a letter- or tabloid-sized page, and give it a white fill with no runaround.

2. Select the box, and make it the size of the document you want (for example, a 2-x-3 business card), using the Modify command from the Item menu or the Measurements palette.

3. Draw two lines with a 0.25-point line weight. One should be horizontal, butting the top of the box, and the other should be vertical, butting the left side of the box. Both lines

should extend about $^1/_4$ to $^1/_2$ inch beyond the box at both ends.

4. Duplicate each line, and drag it to the opposite side.

5. Now drag the zero ruler guide to the top left corner of the text box, and drag the corner to resize the box so that it is $^1/_8$ inch larger than it was at the top and left. Drag the ruler guide to the bottom right corner, and extend the box likewise to the right and bottom. With the box still selected, bring it to the front, using the Item menu.

6. Create a descriptive title

if necessary (for example, "My business card — shoot @ 100%"), and place it appropriately. Select all items, and group them. If you want to save this as a template for future use, drag a copy of it to a library.

7. Now drag the grouped item to an appropriate place on the page, and add any ruler guides as necessary. Continue adding other items to the page as desired (see Figure 2).

Perry Bessas
Cliffside Park, NJ

DeBNDLer

If you keep a lot of font-outline files — also known as printer fonts — on your Mac to use with Adobe Type Manager, you may find that rebuilding your desktop or opening folders containing the printer fonts takes a very long time.

This is because the Finder keeps information about applications, their documents, and their icons in the Desktop file. Each application has a Bundle resource that lets the Finder know that it contains icon information (documents don't have Bundles because their icons are stored in the application). For example, Microsoft Word has a Bundle that tells the Finder about the application's icon as well as about the icons for all Word documents. To guarantee that every printer font has an icon, Adobe ships
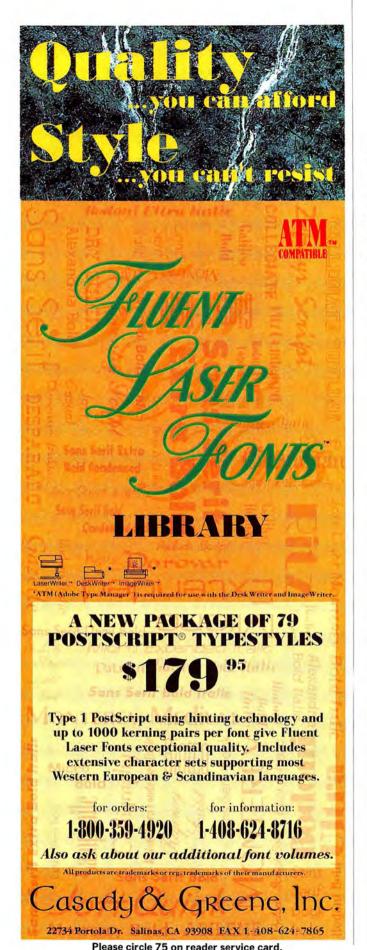
each one with a Bundle. So if you have 20 outline files on your disk and you rebuild your desktop, the Finder will find 20 instances of the same information. If you have a lot of printer fonts and you use Apple's Desktop Manager INIT (part of the AppleShare server software) or System 7.0 (which has the Desktop Manager built in), it can take a long time to open folders containing printer fonts or rebuild the desktop.

To solve this problem, I've written a small application named DeBNDLer. DeBNDLer scans either the active System Folder or the volume where DeBNDLer resides, depending on which radio button you choose — Process Current System Folder or Process This

Drive. DeBNDLer then removes the Bundle information from the files and changes the creator to DeBNDLer. Because all printer fonts are now treated by the Finder as DeBNDLer documents, rebuilding the desktop is much faster. DeBNDLer does not affect either ATM or Adobe's Font Downloader.

Stephan Somogyi
MacUser Project Leader
[*DeBNDLer is freeware. You can download it from Zmac's Applications Library (Lib 1) in the Download Forum (GO ZMC:DOWNLOAD), filename DeBNDL.SIT. Zmac is available on the CompuServe network. If you're not a member of CompuServe, look elsewhere in this issue for information on joining. — Ed.*]

QuarkXPress 3.0 can provide you with useful information about your system configuration in its Environment dialog box. You access it by holding down the Option key when you choose About QuarkXPress from the Apple menu. But if you use QuicKeys 2 or Suitcase II, you can run into problems, because those programs use the Option key to modify menus. Quark suggests that you change this menu-modifier key, but if you have an Apple Extended Keyboard, you don't have to. Hold down the Option and Help keys, and the QuarkXPress Environment dialog box is all yours.

Jay Jemison
Birmingham, AL

Tips from the Experts

Adobe Photoshop

Here are some handy Adobe Photoshop tricks from the magicians at Adobe:

Beyond Masking: Photoshop's painting tools affect only the selected portion of a graphic, and it can be difficult to protect (or mask) an awkwardly shaped object or one that's in the middle of an image you want to work on. A special kind of mask called a frisket lets you select the area you want to protect rather than the area you want to alter; it also keeps your document size smaller than it would be if you created masks in the usual way.

To create a frisket, select the part of the graphic you want to shield and then choose the Inverse command from the Select menu. The area you've selected is now protected (see Figure A).

Magic-Wand Magic: The magic-wand tool sometimes fails to make the desired selection when it's faced with an intricately shaped object, but you can get around this. If the object rests on a simple background, use one of the selection tools to choose the object and some of the background. Then remove the background from the selection by clicking on it with the magic wand while pressing the Command key.

Two Windows Are Better Than One: As with Illustrator 3.0, you'll probably find it productive and helpful to open two Photoshop windows or views on the current graphic. Set one to display your file at its actual size and the other with a zoomed view. This can make working with small graphics or small details of larger graphics easier, and you can still see the graphic as it will appear in its finished size.

Figure A: A frisket, or inverse selection, protected the yellow flower from the effects of Photoshop's painting tools.

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Outbound/Classic Bundle w/40Mb HD, 2Mbs
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AE DataLink MacPortable w/Send Fax $199
1 Mb Upgrade $249
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AE DataLink Mac 2400 Internal (Mac II) $199
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Zoom V.42 bis w/cable & software $199
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No matter which Mac you use, old or new, the MacPro Plus keyboard gives you the ability to get you through your work faster and easier. The 105-key layout is similar to the Apple Extended Keyboard, but with more features. Also included is a free offer for Tempo II Software ($149.⁹⁵ value) $139

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New! Key Tronics MacPro Plus Extended Keybd
   w/Tempo II Software ($99 Value) $139
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Wacom Graphics Tablets .... *Please call*
Kurta Tablet (8 1/2" x 11") $359
Kensington Turbo Mouse ADB $109
Altra Felix Mouse ADB $119

Scanners
DEST Scan 3000 (256 Level gray scale) $1159
Recognize OCR Software (uses only 1Mb) $469
Logitech ScanMan Model 32 .... $319
Microtek MS-II w/Omnitype OCR $839
Microtek MSF 300GS w/SCSI $1339
Microtek MSF 300ZS w/PhotoShop $1895
   Transparency/Slide Upgrade (XRS 3C) $1799
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Farallon Timbuktu 3.1 .... $95
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EtherPrint is an easy to use, easy to afford way to connect your Ethernet network to any LocalTalk compatible printer. **$349**
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MacWorld Magazine rated the Rival the top performing WYSIWYG big screen — outranking dual-page displays costing much more.

Rival 19" Monochrome w/video card $1169
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E-Machines ColorPg T-16 w/video card $2149
E-Machines TXsi $3089
Ikegami CT20 20" Trintron w/8-bit card $2799
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Now you can truly zoom in and out of your work. Zoom out to see 70% more of your job on screen. Zoom in to see a 200% close-up. No matter which software program you're working in you have the power to see your work in 6 sizes and resolutions. (for SE/30, Mac II)
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Apple ImageWriter II w/cable $459
Apple Personal LaserWriter NT .... Call
Apple LaserWriter IINT .... Call
Apple LaserWriter IINTX .... Call
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HP DeskWriter w/cable $759
Kodak Diconix M150 + w/ATM & cable $419
LaserMax 400 .... $2039
Microtek TrueImage Laser Printer $2149
NEC SilentWriter 2 Model 90 w/cable $1799
TI microLaser PS 35 w/AppleTalk $1929
QMS PS-810 w/cable & toner $2995
QMS PS-410 w/cable & toner $2199

Questions, anyone? Here's where to get answers from the experts. Bob LeVitus is the author of the best-selling Dr. Macintosh. *Andy Ihnatko isn't. But he knows a lot about the Mac, and he's got a heck of an attitude. Together, they're ready to answer your questions about everything Macintosh.*

✉ *Write to Help Folder, c/o* MacUser, *950 Tower Lane, 18th Floor, Foster City, CA 94404.*

Don't want to wait for an answer? Post your question on Zmac, MacUser's *on-line service, and get a reply from Bob, Andy, or one of the other* MacUser *experts. See the masthead in this issue for instructions on how to sign up.*

By Bob LeVitus and Andy Ihnatko

Hiding Files

Q. Are there any programs for the Mac that can "hide" the existence of a file so that it doesn't appear in the directory window but also can't be overwritten?

Frederick Wein
Plainsboro, NJ

Bob: Any program that allows you to edit a file's attributes (such as CE Software's DiskTop, Apple Computer's ResEdit, or Symantec's SUM II) can do what you ask. All you have to do is turn on the Locked and Invisible attributes (see Figure 1). To use the file, just reverse the process — use the same program to turn the Locked and Invisible attributes off.

68040 Upgrades?

Q. I am a dedicated Mac user and own an SE/30 that I use for everything, including a lot of processor-intensive applications. I want to upgrade, but I also want to wait and get a really first-rate upgrade. Are there any companies that are planning to offer a 68040 (25-megahertz) upgrade for an SE/30?

By the way, I am a high-school student

working on extremely complicated designs for a mechanical/robotic arm. I need some expensive hardware, but I don't have any money. Any ideas for getting either the money or the hardware?

Nate Sammons
Via CompuServe

Bob: I haven't heard of any 68040 upgrades for the SE/30. But remember, I'm writing in January. I'm willing to bet that more than one third-party 68040 upgrade for the SE/30 will be introduced in 1991. As long as I'm gazing into my crystal ball, I also predict that Apple will introduce one or more new 68040 models sometime this year. An Apple-branded 68040 upgrade for the SE/30 is also a possibility.

As far as inexpensive "expensive" hardware goes, there are a couple of ways a savvy Mac user can save a few bucks on high-powered hardware. First, non-Apple peripherals and upgrades are almost always less expensive than their Apple-labeled counterparts. So if you're looking for a big hard disk or monitor, consider vendors other than Apple.

Another thing to consider is buying used equipment. Used computers and peripherals
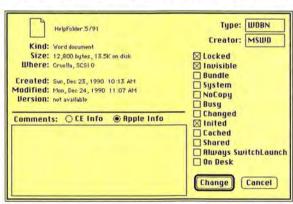
Figure 1: Any program that can edit file attributes (DiskTop in this picture) lets you "hide" files in the directory by turning on their Locked and Invisible attributes.

✳ . . . But Were Afraid to Ask

Who ever said there was such a thing as a stupid question? OK, my chem professor did, but he said it only to me. The only stupid question is the question you don't ask. Here at Help Folder, we don't care how simple you think your question is . . . just send it in! (If it's such a simple question that you're embarrassed even to ask it, we'll conceal your identity by crediting the question to an additive in a well-known diet soft drink.)

Q. Can you help out a neophyte Mac user? Let me start out by saying that I shouldn't have let my nine-year-old son play with my Mac. It's been working fine, but my Apple menu has started flashing on and off, on and off, on and off. It was kind of fun at first, but now it's really getting on my nerves. *How do I turn it off?*

Potassium Benzoate
Atlanta, GA
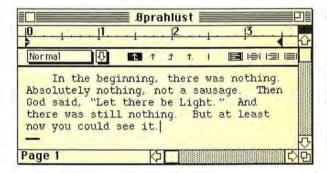
Andy: First off, I'd like to address the thousands of *MacUser* readers out there who are at this moment moaning, "Not *that* question again! When are they going to talk about VDAC allocation exceptions in the IIci?" Now hush. People have been dumbfounded by the flashing Apple menu every day since 1984; it's a perfectly valid question.

So, Potassium, that flashing is just the Alarm Clock DA's way of telling you that an alarm has gone off. Open up the Alarm Clock DA (which you'll find on the Apple menu) and turn off the alarm, and your problem should be solved. A mere bag of shells, as Ed Norton would say.

By the way, I'm impressed with your nine-year-old. Give him a soldering iron and a copy of MacApp for his birthday this year, and maybe by the time he's 18, you'll be able to live off his money!

Figure 2: If you need someone to tell you to take a break from your Mac, LifeGuard from Visionary Software will nag you in a variety of ways, plus give you suggestions for noncomputing activities and exercises.

In the beginning, there was nothing. Absolutely nothing, not a sausage. Then God said, "Let there be Light." And there was still nothing. But at least now you could see it.

Figure 3: Here's what you see on-screen (top), and here's what you get when you use the ImageWriter driver to print to a daisywheel device (bottom). If you can live with the erratic spacing, you'll save about $80.

can be excellent values. Your local newspaper's classified section is a good place to start. Also, several vendors advertise used and refurbished equipment in *MacUser*'s Marketplace section.

Andy: You can also try writing to the companies that make the hardware you're interested in and explain your situation. Some companies actually loan — or sometimes even donate — old equipment they have lying around the office. It's certainly worth a stamp to find out!

Eye and Body Saver?

Q. I've seen many screen savers but I've never heard of an eye saver. Is there an INIT that could turn my monitor off every hour for five minutes or so and let me focus on something away from my computer?
Louis Veillette
Via Zmac

Bob: Good question, Louis. But it's more than just your eyes — your whole body is at risk. The National Academy of Sciences reports that more than half of all video-display and microcomputer users polled

complained of eyestrain, headaches, and muscle pain, and *BusinessWeek* reports that RSI (repetitive-strain injury) is the fastest-growing occupational disease of the 1990s.

The best way to protect yourself is to take a break every so often and do something else. I know I should do this, but I forget more often than not, which is why I'm so impressed with a software product called LifeGuard.

LifeGuard is an INIT and DA from Visionary Software that interrupts your work at customizable intervals — with an audible or visual notification — and reminds you to do something else (see Figure 2). It also keeps track of the number of keystrokes you've made in the past hour (according to the manual, experts recommend you keep your keystrokes to fewer than 12,000 per hour). The DA includes illustrated exercises for the eyes, neck, shoulders, back, arms, wrists, hands, and legs, plus ergonomic reference diagrams to help you create a workstation that won't cause you pain.

Andy: Another solution is to keep a TV set on in the next room or better yet a small child. I guarantee you won't get more than ten minutes' work done at any one stretch.

Daisywheel and Deal

Q. I recently switched from an Apple II Plus to a Mac II. I love the more powerful word processors but hate the Mac's dot-matrix printers. Is there a way I can hook up my old daisywheel printer to my Mac II and still get that letter-quality output?
Martin Asdorian, Jr.
Bedford, TX

Andy: Piece of cake, Martin — you just have two humongous problems to deal with before you can get started. Problem 1 is that only a printer with a serial interface can be connected to the Mac. (*Interface* here just means the way the printer's hardware talks to

the computer's hardware, and there are two kinds: parallel, which is incredibly, amazingly fast, and serial, which is only amazingly fast.) If your old printer is serial, then you need a Mac II-to-ImageWriter I printer cable. If it's parallel, you'll have to find a way to convert the signal. There are a bunch of parallel-to-serial converters on the market, selling for anything from $50 to $150. Depending on how you set it up, the converter will either translate serial to parallel or (if you're using a dot-matrix printer) it'll translate the ImageWriter-type printer codes into your printer's codes.

Problem 2 is persuading the Mac that it's not hooked up to an ImageWriter or LaserWriter. See, one of the Mac's high-scoring concepts is that each Mac program doesn't have to know how to deal with several different printers. As long as the program plays by the rules, it can print on any printer whatsoever, assuming there's a driver for that printer in the System Folder (the driver describes the printer, its features, and how it operates). That's the good news. The bad news is that the only drivers Apple gives away (or even officially supports) are the drivers for its own printers, which are ImageWriters and LaserWriters.

Fortunately, drivers for non-Apple printers are available from lots of non-Apple companies, notably GDT Softworks. Its MacDaisy Link (about $80) is a set of drivers designed for use with more or less generic daisywheel printers and should serve your needs just fine.

I have to tell you, however, that you can get by pretty well if you use the plain old ImageWriter driver — if you don't mind some inconsistencies in spacing. When set to Draft mode, the ImageWriter driver sends raw ASCII text through the serial port, spacing the letters to approximate
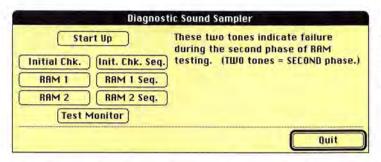
Figure 4: Name That Crash: Diagnostic Sound Sampler explains your Mac's error tones.

what's on-screen (see Figure 3). The letters are printed in whatever character face is built in to your printer. For best results, use a monospaced font (such as Monaco or Courier) at the same size as your printer's typewheel (typically 10 or 12 points), and keep the fancy formatting to a minimum. It's a bit of a trade-off; an additional space may be added here and there (although on my printer it's hardly noticeable), but you're saving yourself $80.

The last cheapo solution is to do your word processing with a program that — like your old Apple II — deals only with plain ASCII text to begin with, such as the shareware DAs MiniWriter and McSink.

Managing User Access

Q. In one of our labs, we have ten Mac IIcx's. We need a software package that allows the students to access installed applications, DAs, and fonts; copies their files to and from the hard disk via the floppy-disk drive; and prints their files. But we want to prevent them from accessing the Control Panel; initializing the hard-disk drive; accessing Set Startup; or copying applications, DAs, or fonts to and from the hard disk via the floppy-disk drive.

The perfect software package would let teachers access the Control Panel and regain full access to all aspects of the Mac by using a password. Does such software exist?

Guy Dalbec
Ottawa, Ontario
Canada

Bob: A.M.E. from Casady

& Greene is the only product I know of that can do everything you ask. Unfortunately, my experience with A.M.E. was mixed. Although it is easily the most powerful security product I've seen, the version I used, 1.1.3, rendered one of my hard-disk drives temporarily inaccessible, requiring me to send the drive to Casady & Greene for repair. (For what it's worth, Casady & Greene's tech support was excellent and the hard disk was returned within 48 hours with all its data intact.) In A.M.E.'s defense, there have been several bug-fix releases since then, and apparently the problem I experienced has been isolated and fixed in later versions (the current shipping version is 1.1.7, and Casady & Greene say version 2.0 may be out by press time).

My advice: Give A.M.E. a try, but be sure you're religious about maintaining backups in case anything should go wrong.

Andy: I like ASD Software's FileGuard myself. It doesn't restrict access to the Control Panel, but it does allow you to set different access levels to folders, docs, and applications.

The Dreaded Error Tones

Q. Drat! My Mac SE/30 gives me an error tone when I boot up first thing in the morning — not every day but often enough to cause concern. When I boot up the computer, the error tone sounds like "ba-baa bum" and the screen turns into a series of alternating horizontal black and white lines. My local dealer said it might

be due to the moisture in my garage office; another technician said that it's probably damage to the motherboard or RAM and asked if I had done a memory upgrade recently. He said that the damage was probably static-related. I was pretty surprised by this, because I wore an antistatic wrist strap when I did the upgrade. The people from whom I bought the chips told me that static damage was rare and that they don't wear wrist straps even when they're working on their own machines. Is it possible that I did serious static damage to my Mac even while wearing a strap? If so, shouldn't you and mail-order RAM suppliers be more careful in warning people who install RAM themselves about the dangers? Also, why don't I get the error tones consistently? Help!

Dick J. Godbey
Columbia Falls, MT

Andy: Your letter brings up a whole basket of different topics, requiring me to separate them into different acts, just like an episode of "The Streets of San Francisco."

Act 1: The Error Tone. The Mac has a cryptic system of error ID codes, which is supplemented by a system of cryptic error tones. If there's a hardware problem, on startup you'll hear the specific tone that tells you it's time to send Apple some more money. Your "ba-baa bum" sounds like the beloved "Stage 2 RAM error." This means that your RAM is acting somewhat — but not terminally — screwy, which is consistent with an intermittent RAM problem.

To learn more about the Mac's error tones, the Library of Congress recommends Diagnostic Sound Sampler, a program that plays all the tones and explains what they mean (see Figure 4). You should be able to get a copy of this program from a user group such as BMUG (Berkeley Macintosh Users Group).

Act 2: Static Electricity. For the rest of the world, static electricity is what makes a balloon stick to the wall after you rub it on your head, but to computer jocks, it's a force of evil that zaps and destroys electronic components, especially RAM chips. Let there be no doubt that if you shuffle your feet across a carpeted floor on a dry winter day and then touch a SIMM, you'll probably fry the memory.

You need to take some precautions whenever you perform open-Mac surgery. A wrist strap (a band on your wrist that's wired to an electrical ground) is the usual antistatic weapon; any charge you build up passes harmlessly to ground instead of through your Mac. However, due to hairy wrists or a bad strap, sometimes these straps don't work. Personally, I just make a point of touching something big and metal (such as my steel work table or a wall plate) before opening the case. This is a sure way of liberating those pent-up electrons.

Act 3: What Happened to Your Mac. I dunno, but something's definitely wrong with your memory, and static electricity is usually a good scapegoat for that kind of problem. The fact that it's a *sporadic* problem makes me suspicious — when a SIMM is killed by static electricity, it usually stays killed. The sporadic nature of the problem could be due to the moisture in your garage. In a certain range of meteorological situations, electrons can't reliably make their trip from the motherboard into the SIMM module.

Move the Mac into the house for a while or install a dehumidifier in your garage, and see if the problem goes away by itself. If not, then maybe the SIMM contacts have become dirty from dust and/or moisture. Get some TV tuner cleaner and clean all your SIMM's contacts (those silvery pads at the bottom of the SIMM) with a cotton swab. If you're adventurous, clean the sockets on the motherboard too; I do it by spraying cleaner on a strip of thin cloth, wrapping the cloth around the SIMM, and then inserting the SIMM into the slot a few times. (Cover-My-Rear-End Department: *Remove the cloth before starting up your Mac!*)

Another simple procedure is to swap suspect components for ones you know to be good. You could try replacing the new 1-megabyte SIMMs with your old 256K ones (you *did* save them, didn't you?), or if you have access to a friend's (or better yet, an enemy's) Mac, install your current SIMM set into another machine. If your Mac springs back to life or if the other Mac bites the clay Eskimo, then you know you have defective SIMMs.
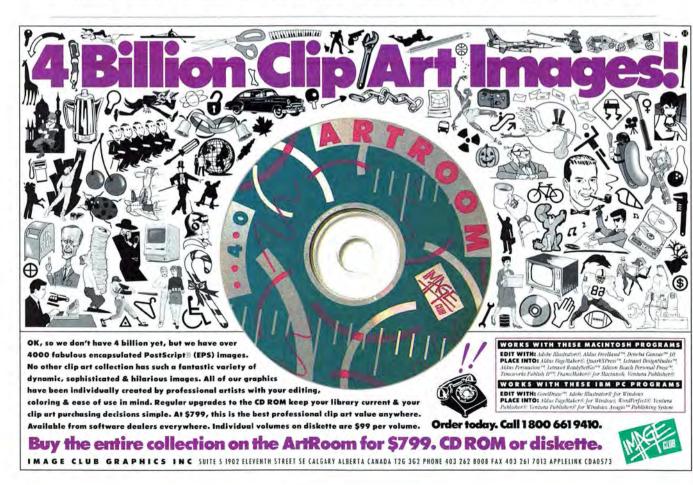
Epilogue: Doing Upgrades Yourself. Upgrading memory may *seem* like a hazardous, daunting job, but once you've done it, you wonder why you were so worried about it. I'll go even further and say that opening up your Macintosh and taking an informed poke around its innards is invaluably educational.

The folks you bought the SIMMs from were telling you the Plain Truth about static electricity. If you first ground

Figure 5: Use the CD Remote DA and Apple's CD-ROM player to listen to your favorite tunes.

yourself (by touching an electrical ground or by wearing a wrist strap), your Mac's chances of becoming a victim of static are next to nil. If you're

just plain rolling in dough, then sure, spend the extra $100 or $200 to have an upgrade inflicted by a professional. The only advantage is that if

something goes wrong — all together now — you'll have someone to sue.

Although thousands of folks use and swear by wrist straps, there is a very vocal minority that feels that providing electrons with a path to ground via your own body may not be such a great idea, in that it may increase your chances of electrocution. Personally, I'm very skeptical of this and haven't heard of any strap-related injuries, but I am presenting the info anyway.

CD-ROMs on a Laserdisc Player?

Q. Is it possible to play a CD-ROM on a video laserdisc player?

Lisa Scatt
Austin, TX

Bob: Interestingly, you can play music CDs on the Apple CD-ROM drive. Apple even provides you with a nifty remote control — CD Remote — to let you choose which song you want to hear (see Figure 5).

But to answer your question, Lisa, No, you can't play a CD-ROM on a laserdisc player — not yet, anyway. I'm waiting for a universal laser player that reads CD-ROMs, audio CDs, and video laserdiscs. I expect it won't be long before one is announced. When one does appear, as long as it's not ridiculously expensive, you'll find me first in line to buy it.

Devices with Only One SCSI Port

Q. I have two devices — a scanner and a CD-ROM drive — that each have only one SCSI connection. Is there any way to connect both devices on the same SCSI bus? I don't look forward to turning off my Mac, disconnecting one device, connecting the other, and then restarting each time I want to use one or other of the devices. This is especially inconvenient if I'm working on a DTP project in which I'm using the scanner as well as clip art from the CD-ROM drive.

Paul Selsor
Salem, OR

Bob: I think you're out of luck. If a device has only one SCSI port, it has to be the last device in the SCSI chain. Because you have two devices that have only one SCSI port and only one device can be the last device in the chain, one device will have to remain unconnected.

There may be a solution, however. Tecmar ships a "T" connector with its single-SCSI-port tape drives. You can buy the connectors individually through a dealer for $79 (part number 811677). If you're feeling creative, you might be able to jury-rig one of your own with some 50-pin connectors and ribbon cable, but there's no guarantee this homemade connector will work properly in your setup.

Andy: If you have an extra Macintosh handy (ha!), you could always hook it up to the CD-ROM drive, establish it as an AppleShare file server, and then AppleTalk it to your personal Macintosh. You'll then have both the CD-ROM drive and the scanner available simultaneously, but I kind of doubt that this was the solution you were hoping for (unless, of course, you have a large expense account or you work for the government!). 🖱

MINIFINDERS

elcome to MiniFinders, your personal buyer's guide. This month's installment features a roundup of hardware products reviewed and rated over the past few years. For more recent reviews of color products and fax modems, please see the lab reports in this month's issue. *MacUser* editors carefully select and evaluate each product, assigning ratings from one to five mice, in half-mouse increments. All the ratings are relative within a category, and because the market is always changing, our ratings change too. We've indicated all of our Eddy (Editors' Choice) Award winners with a ★, along with the year in which they were recognized for their excellence.

MINIFINDER INDEX

● DISPLAY SYSTEMS

Apple AppleColor High-Resolution RGB Display
🐁🐁🐁🐁½
The 13-inch AppleColor High-Resolution RGB Display sets the standard for monitors for focus and color quality. It's very bright with no built-in glare protection. Can support 24-bit color when used with the Apple Macintosh Display Card 8•24 and 8•24GC. Its 69-dpi screen resolution gives a slightly larger-than-WYSIWYG image. Very reliable workhorse. Requires video card (optional with Mac LC, IIci, or IIsi). $999; with Display Card 4•8, $1,647. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (May '90)

Apple High-Resolution Monochrome Display **🐁🐁🐁**
The Apple High-Resolution Monochrome Display is a 12-inch monochrome landscape-oriented monitor that can accommodate the full width and more than half the length of a letter-sized page. It has a dim screen with average focus. Requires Mac II series with video card (optional with Mac IIci and IIsi). $299; with 1-bit video card,

$498. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Apr '90)

Apple Portrait Display **🐁🐁🐁🐁½**
The 15-inch Portrait Display features a bright, crisp display; good glare protection; perfect geometry; and almost no nuisance factors. Can produce up to 256 gray levels, using a Macintosh Display Card 8•24. Its cable is odd — make sure it fits your card. No software is included. Requires Mac II series with video card (optional with Mac IIci and IIsi). $1,099; tilt-and-swivel stand, $89. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Feb '91)

Apple Two-Page Monochrome Monitor **🐁🐁🐁🐁**
The Apple Two-Page Monochrome Monitor is a 21-inch two-page display that features good focus, but has a dim display and moderate glare protection. Includes a card that can be upgraded to 256 levels of gray. Requires Mac II series with video card. $2,149. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or

(408) 996-1010. (Apr '90)

CalComp DrawingCard ChromaVision **🐁🐁🐁🐁**
This 21-inch color monitor features good focus, sharpness, and color tracking. It is able to display two A4 pages. Has uneven screen coloration. Requires Mac II series. 8-bit ChromaVision, $6,395; 24-bit ChromaVision Plus, $8,595. CalComp, 2411 W. La Palma Ave., Anaheim, CA 92801. (800) 225-2667 or (714) 821-2000. (May '90)

Calcomp DrawingCard GrayVision **🐁🐁🐁**
This expensive display system offers good glare protection and a tilt/swivel stand. It has a few problems that are too serious to ignore, however, including below average ratings in sharpness and focus. Its video card is not color-capable. Requires Mac II series. $3,195. CalComp, 2411 W. La Palma Ave., Anaheim, CA 92801. (800) 225-2667 or (714) 821-2000. (Oct '90)

Cutting Edge Full Page Display **🐁🐁🐁**
The Cutting Edge Full Page Display is a 15-inch monochrome monitor with average image quality. Screen geometry is good, and nuisance factors are minimal. More expensive than comparable monitors. Requires Mac Plus or later. $899. Cutting Edge, 97 S. Red Willow Rd., Evanston, WY 82930. (307) 789-0582. (Feb '91)

DTI SpeedView Portrait Monitor **🐁🐁🐁🐁**
The SpeedView is a full-page display designed for users who need large screen acreage to view full tabloid-sized pages. Image quality is impressive, because it's competitive with that of smaller 15-inch displays. Comes with a monochrome or gray-scale card. Requires Mac II series. $2,495. Digital Technology International, 500 W. 1200 S., Orem, UT 84058. (801) 226-2984. (Feb '91)

E-Machines ColorPage 15 **🐁🐁½**
The 15-inch ColorPage 15 offers good glare protection and excellent software. It suffers from dim display, poor focus, and poor color quality. $1,595. E-Machines, Inc., 9305 S.W. Gemini Dr., Beaverton, OR 97005. (503) 646-6699. (May '90)

E-Machines ColorPage T16 **🐁🐁🐁🐁🐁**
The ColorPage T16 is simply one of the best and brightest 8-bit color monitors. It's a razor-sharp Sony Trinitron display with nearly perfect color, and the video card is excellent. Requires Mac II series with NuBus adapter. $2,998.

E-Machines, Inc., 9305 S.W. Gemini Dr., Beaverton, OR 97005. (800) 344-7274 or (503) 646-6699. (May '90)

E-Machines The Big Picture 17" **🐁🐁🐁**
This 17-inch monochrome monitor has a greenish tint. Focus is satisfactory, but brightness is uneven, and there is slight ghosting. $1,650. E-Machines, Inc., 9305 S.W. Gemini Dr., Beaverton, OR 97005. (800) 344-7274 or (503) 646-6699. (Apr '90)

E-Machines TX **🐁🐁🐁🐁🐁**
The TX uses the same phyiscal monitor as the T16 but includes a higher-resolution video card. The 87-dpi screen resolution is good for CAD and freehand drawing, but it can make text hard to read unless the type size is increased. Requires Mac SE/30 or II series with NuBus adapter. $4,495. E-Machines, Inc., 9305 S.W. Gemini Dr., Beaverton, OR 97005. (800) 344-7274 or (503) 646-6699. (May '90)

E-Machines QuickView Z21 **🐁🐁🐁½**
This 21-inch monochrome monitor has four dpi settings (36, 40, 72, and 80). Its display is dim and not very sharp. Includes a simple gray-scale upgrade and a virtual screen. Good software. Requires Mac SE, SE/30, or II series. Mac SE, $2,390; SE/30 and II series, $2,490. E-Machines, Inc., 9305 S.W. Gemini Dr., Beaverton, OR 97005. (800) 344-7274 or (503) 646-6699. (Apr '90)

Ehman Full Page Display **🐁🐁🐁½**
The Ehman Full Page Display, with its 15-inch monochrome screen, is well worth the investment. Performance is not as high as that of some more expensive monitors and image quality is average, but this is still a good bargain. Requires Mac Plus or later. $499. Ehman Engineering, Inc., 97 S. Red Willow Rd., Evanston, WY 82930. (800) 257-1666 or (307) 789-3830. (Feb '91)

Ehman Two Page Monitor **🐁🐁🐁½**
This 19-inch monochrome monitor scores above average in brightness and focus but only fair in its nuisance rating. Includes Stepping Out II software. Requires SE, SE/30, or Mac II. $899. Ehman Engineering, Inc., 97 S. Red Willow Rd., Evanston, WY 82930. (800) 257-1666 or (307) 789-3830. (Apr '90)

Generation Systems CT-II **🐁🐁🐁🐁**
The 20-inch CT-II monitor is bright and fairly sharp. Offers

MICE RATINGS 💣 .... 🐁 .... 🐁½ .... 🐁🐁 .... 🐁🐁½ .... 🐁🐁🐁 .... 🐁🐁🐁½ .... 🐁🐁🐁🐁 .... 🐁🐁🐁🐁½ .... 🐁🐁🐁🐁🐁

excellent color and software. Mac II or SE/30, 8-bit, $3,999; Mac II, 24-bit, $4,999. Generation Systems, 1185-C Bordeaux Dr., Sunnyvale, CA 94089. (800) 448-8231 or (408) 734-2100. (May '90)

MacProducts
Magic View Color ♦♦♦
This 14-inch color monitor features excellent convergence and some of the best gray linearity available, enabling it to display subtle image variation. A blotchy screen and lack of software diminish its value. Requires Mac SE/30 or II series. Mac II, 8-bit, $699; SE/30, 8-bit, $719. MacProducts USA, Inc., 8303 Mopac Expy., #218, Austin, TX 78759. (800) 622-3475 or (512) 343-9441. (May '90)

MacProducts MagicView 19 ♦♦♦½
MagicView's solid 19-inch monochrome monitor has a bright display, above-average MTF-sharpness ratings, and fair focus. $899. MacProducts USA, Inc., 8303 Mopac Expy., #218, Austin, TX 78759. (800) 622-3475 or (512) 343-9441. (Apr '90)

MacTel Technology Index
Portrait Display System ♦♦♦
The Index Portrait Display provides a 15-inch-diagonal monochrome screen with average image quality. Focus is below average but adequate. More expensive than comparable monitors. Video cards are available for the SE, SE/30, and Mac II family. Comes with tilt/swivel stand. $625. MacTel Technology, 3007 N. Lamar, Austin, TX 78705; (800) 950-8411 or (512) 451-2600. (Feb '91)

Mass Microsystems
ColorSpace IIi/FX ♦♦♦♦
The Mass Microsystems ColorSpace IIi/FX board combo brings live 24-bit video to the Mac. The FX board converts composite NTSC or PAL video signals to RGB for display on a Mac monitor. The IIi lets you mix live video with computer graphics. Utilities include the Digitizer DA, Desktop Video DA, and MacTV. The software is somewhat quirky, but the boards deliver true live-video-overlay functionality. Requires Mac II series. $2,299.95; ColorSpace FX, $3,499.95; cable, $99.95. Mass Microsystems, Inc., 810 W. Maude Ave., Sunnyvale, CA 94086. (800) 522-7979 or (408) 522-1200. (Mar '90) ★ '88 Eddy

MegaGraphics
MegaScreen 2008 ♦♦♦♦
This 19-inch monitor rates low on the sharpness scale but offers good focus and excellent color. A 16-inch system is also available. Mac II, 8-bit, $3,999; SE/30, 8-bit, $6,198. MegaGraphics, 439 Calle San Pablo, Camarillo, CA 93012. (800) 423-0183 or (805) 484-3799. (May '90)

MegaGraphics
MegaScreen Rival ♦♦♦♦
This 19-inch monochrome monitor features superior contrast, displaying true whites and deep blacks. Excellent brightness and average focus make it a smart choice. Mac Plus, $1,748, Mac SE, SE/30, or II series, $1,698. MegaGraphics, 439 Calle San Pablo, Camarillo, CA 93012. (800) 423-0183 or (805) 484-3799. (Apr '90)

Micro Display MacGenius ♦♦♦♦
This 15-inch monochrome monitor offers a bright display and innovative software that includes inverse-video capabilities. It gives Plus and SE users an attractive video option. Some installation difficulty. Requires Mac Plus, SE, or II series. Mac II series, $1,495; Plus or SE systems, $995. Micro Display Systems, 755 E. 31st St., Hastings, MN 55033. (800) 328-9524 or (612) 437-2233. (Apr '90)

Mirror Technologies
PixelView I ♦♦♦½
This monochrome full-page display is unusual, in that it can be used with a Mac Plus, for which it includes special software. Image quality is average. $567. Mirror Technologies, 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Feb '91)

Mobius Technologies One Page Display ♦♦♦♦
A good choice for SE owners, the 15-inch monochrome One Page Display offers an interface card with a CPU accelerator to speed up processing. Screen-extension software for the SE is also included. Requires Mac SE, SE/30, or II series. $795. Mobius Technologies, Inc., 5835 Doyle St., Emeryville, CA 94608. (800) 669-0556 or (415) 654-0556. (Feb '91)

Moniterm Viking 2/72 ♦♦♦♦
This 19-inch monochrome monitor has high sharpness and focus ratings. Requires Mac SE, SE/30, or II series. $1,795. Moniterm, 5740 Green Circle Dr., Minnetonka, MN 55343. (612) 935-4151. (Apr '90)

Moniterm Viking 2400 ♦♦½
Big monitors are generally hard to focus, and the 24-inch Viking 2400 is no exception. It offers OCLI coating for glare protection, however. Requires SE or II series. $2,595. Moniterm, 5740 Green Circle Dr., Minnetonka, MN 55343. (612) 935-4151. (Apr '90)

Nutmeg 19" Mono Display ♦♦♦♦
This 19-inch monochrome monitor is bright, with average focus and fair geometry. Good software, including Stepping Out II. $1,699. Nutmeg Systems, 25 South Ave., New Canaan, CT 06840. (203) 966-3226. (Apr '90)

PCPC II 19"
Color Graphics System ♦♦♦½
The 19-inch PCPC monitor has average sharpness, average gray linearity, and good convergence. Color is excellent. The display reveals a noticeable flicker. Includes Stepping Out II software. Offers 16-bit capability for SE/30 system. Mac II, 8-bit, $5,995. Personal Computer Peripherals Corp., 4710 Eisenhower Blvd., Building A4, Tampa, FL 33634. (800) 622-2888 or (813) 884-3092. (May '90)

Princeton Publishing
MultiView II ♦♦½
This monitor received poor geometry and focus ratings. Not recommended. Requires Mac SE or later. $555; with board for Mac SE or SE/30, $845. Princeton Publishing Labs, Inc., 101 BusinessPark Dr., Ste. 100, Skillman, NJ 08558. (609) 924-1153. (Feb '91)

Radius Color Display ♦♦♦♦
The Radius Color Display uses a 19-inch Sony Trinitron tube. Depending on the board installed, 8- and 24-bit color is supported. The 82-dpi screen resolution isn't WYSIWYG, but the display can show two full 8.5-x-11-inch pages. Low MTF sharpness, good focus, fair convergence, and excellent software. The 24-bit model has an optional QuickDraw accelerator. Requires Mac II series. Mac II, 8-bit, $6,190; Mac II, 24-bit, $8,390. Radius, Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (May '90)

Radius Pivot ♦♦♦♦
The Radius Pivot is an impressive 15-inch full-page monitor that features a high-quality display with great focus and excellent brightness. It's expensive, but it has the unique ability to rotate 90 degrees between portrait and landscape orientation. A good monitor on the brink of being great. Requires SE/30 or Mac II series. $1,690. Radius, Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (Feb '91)

Radius Two Page Display/19 ♦♦♦♦
The Radius Two Page Display/19 is a bright, well-focused, 19-inch monochrome display system that comes with Radius' justly famous software, which includes tear-off menus and screen-capture capabilities. This unit is expensive compared with similar systems. Requires Mac SE, SE/30, or II series. $1,990. Radius Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (Apr '90) ★ '88 Eddy

Radius Two Page Display/21 ♦♦♦♦½
This monitor lacks perfect WYSIWYG, but it does display a great deal of information. It performed well on all tests except MTF sharpness. Its lack of glare protection is a trade-off for its brightness. Excellent geometry.

Its linearity, focus, and lack-of-nuisance ratings are above average. Requires Mac SE, SE/30, or II series. $2,390. Radius, Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (Oct '90)

RasterOps ClearVue/GS ♦♦♦♦
RasterOps' 19-inch ClearVue/GS offers excellent focus and above-average brightness and MTF sharpness but below-average linearity and geometry. Color and SE/30 boards available. Requires Mac II series. $2,195. RasterOps, 2500 Walsh Ave., Santa Clara, CA 95051. (800) 468-7600 or (408) 562-4200. (Oct '90)

RasterOps ClearVue/SE ♦♦♦♦½
A "best buy" for SE owners, the 19-inch ClearVue display system features a video card that doubles as a CPU accelerator. This model received a high score for its MTF sharpness and offers good focus and brightness. Includes excellent software. $1,795. RasterOps, 2500 Walsh Ave., Santa Clara, CA 95051. (800) 468-7600 or (408) 562-4200. (Apr '90)

RasterOps Video ColorBoard 364 ♦♦♦♦½
The RasterOps 364 is an excellent 24-bit color-graphics and live-video display card with very good software. It doesn't require a separate display system to drive your monitor and comes with extras such as a set of MacroMind Director X-Objects and a Hyper-Card stack with video XCMDs. Running it with memory- and CPU-intensive applications is impractical on machines with less than 8 megabytes. $1,995. Raster-Ops, 2500 Walsh Ave., Santa Clara, CA 95051. (800) 468-7600 or (408) 562-4200. (Oct '90) ★ '90 Eddy

Relax Ikegami Trinitron ♦♦♦½
An annoying flicker and a slight convergence problem mar this otherwise solid 20-inch monitor. Excellent sharpness. $4,995. Relax Technology, 3101 Whipple Rd., Union City, CA 94587. (800) 848-1313 or (415) 471-6112. (May '90)

Sigma Designs
ColorMAX 8/24 ♦♦♦♦½
The 19-inch ColorMAX 8/24's video card can easily be converted from 8 bits to 24 bits for users wanting 16.8 million colors. Good general-purpose system, but it lacks software. Requires Mac II series. 8-bit system, $6,095; 24-bit system, $6,695. Sigma Designs, 46501 Landing Pkwy., Fremont, CA 94538. (415) 770-0100. (May '90)

Sigma Designs L-View ♦♦♦♦½
This 19-inch monochrome monitor leads the pack in sharpness and focus. Includes exceptional software. Requires Mac SE, SE/30, or II series. Mac II or SE/30, $2,495; for Mac SE, $2,395. Sigma Designs, 46501 Landing

Pkwy., Fremont, CA 94538. (415) 770-0100. (Apr '90)

Sigma Designs PageView ♦♦♦½

This full-page monochrome monitor offers multiple resolutions — 72, 80, and 88 dpi. Performance is good, and the screen is sharp. You can buy just the monitor with cable, without a video card, for the Mac IIsi and IIci to save money. Requires Mac SE or later. $1,199; IIsi and ci, $899. Sigma Designs, 46501 Landing Pkwy., Fremont, CA 94538. (415) 770-0100. (Feb '91)

Sigma Designs SilverView ♦♦♦♦

The 21-inch SilverView is a bargain, priced slightly higher than most 19-inch monitors. It features a bright, well-focused display; excellent software; and above-average geometry. Requires SE, SE/30, or II series. $1,999; with 256 gray levels, $2,399. Sigma Designs, 46501 Landing Pkwy., Fremont, CA 94538. (415) 770-0100. (Apr '90)

SuperMac 19" Platinum Display ♦♦♦♦♦

This monitor performs exceptionally well and has a complete feature set, including a color-capable card, hardware pan and zoom, a virtual desktop, and glare protection. Excellent focus, geometry, and lack-of-nuisance ratings. Above-average brightness and sharpness. Requires Mac II series. $1,399; monochrome card, $499. SuperMac Technology, 485 Potrero Ave., Sunnyvale, CA 94086. (408) 245-2202. (Oct '90)

SuperMac 19" Dual-Mode Trinitron Display ♦♦♦½

This bright, fairly sharp 19-inch color monitor has excellent focus. Includes hardware pan and zoom and a QuickDraw accelerator. Requires Mac II series. $4,200. Accelerated 8-bit-color-graphics cards: Spectrum/8 PDQ, $1,899; Spectrum/24 Series 3, $2,999; Spectrum/24 PDQ, $3,999. Graphics card: Spectrum/8 Series 3, $999. SuperMac Technology, 485 Potrero Ave., Sunnyvale, CA 94086. (408) 245-2202. (May '90)

SuperMac SuperMatch 19" Color Display ♦♦♦♦

This bright, fairly sharp 19-inch color monitor has good convergence but poor gray linearity. Includes hardware pan and zoom as well as a QuickDraw accelerator. Requires Mac II series. $2,800. Accelerated 8-bit-color-graphics cards: Spectrum/8 PDQ, $1,899; Spectrum/24 Series 3, $2,999; Spectrum/24 PDQ, $3,999. Graphics card: Spectrum/8 Series 3, $999. SuperMac Technology, 485 Potrero Ave., Sunnyvale, CA 94086. (408) 245-2202. (May '90)

Taxan Crystal View ♦♦♦♦

This 19-inch monochrome monitor is bright — but has poor subjective focus despite high MTF. $1,695. Taxan, 161 Nortech

Pkwy., San Jose, CA 95134. (408) 946-3400. (Apr '90)

● INPUT DEVICES

Abaton 8-bit Apple Upgrade ♦♦♦♦

This upgrade kit turns a 4-bit Apple Scanner into an improved 8-bit Abaton 300/GS with access to 256 gray levels. $595. Abaton Technology, 48431 Milmont Dr., Fremont, CA 94538. (415) 683-2226. (Sept '90)

Abaton Scan 300/GS ♦♦♦½

Abaton's gray-scale flatbed scanner produces good halftones. Bundled with Digital Darkroom and ImageStudio. $1,595. Abaton Technology, 48431 Milmont Dr., Fremont, CA 94538. (415) 683-2226. (Sept '90)

Agfa Focus S800GS ♦♦♦♦

The Focus S800GS is a 400-dpi, 6-bit gray-scale scanner that simulates resolutions up to 800 dpi. It has superior resolution and good halftone quality. Professional-quality software includes extensive editing capability and printing options. Requires Mac Plus or later with 1 megabyte of RAM; MC View software required for use with Mac. $3,995; MC View software, $495. Agfa Compugraphic, 200 Ballardvale St., Wilmington, MA 01887. (800) 227-2780 or (508) 658-5600. (June '89) ★'88 Eddy

Agfa Focus II 800GSE ♦♦♦♦½

Agfa's 8-bit gray-scale flatbed scanner has 400-dpi resolution and excellent, intuitive software that has automatic calibration and sophisticated image-editing capabilities. A first-rate product. MC View software required for use with Mac. $5,495; MC View software, $495. Agfa Compugraphic, 200 Ballardvale St., Wilmington, MA 01887. (800) 227-2780 or (508) 658-5600. (Sept '90)

Apple Scanner ♦♦♦½

The Apple Scanner is not state of the art but is adequate for neophytes. This 4-bit (16 gray-level) scanner comes with AppleScan software as well as HyperScan, written by Bill Atkinson. Requires appropriate SCSI cables. $1,799. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Sept '90)

Barneyscan CIS●3515 ♦♦♦♦

This color-slide scanner yields excellent color. Fast, easy to set up, and one of the few scanners that offers postscanning image-manipulation tools. $9,495. Barneyscan, 1125 Atlantic Ave., Alameda, CA 94501. (415) 521-3388. (Sept '90)

Chinon DS-3000 ♦♦♦½

Chinon's 300-dpi monochrome overhead scanner is inexpensive but slow. Despite its poor resolvability, it's a good OCR alternative. $895. Chinon America, 660 Maple Ave., Torrance, CA 90503. (213) 533-0274.

(Sept '90)

Complete PC Complete Half-Page Scanner/400 ♦♦♦½

This black-and-white hand-held scanner features true 400-dpi resolution, making it an excellent OCR tool. $399. Complete PC, 1983 Concourse Dr., San Jose, CA 95131. (800) 634-5558 or (408) 434-0145. (Sept '90)

DataDesk International Switchboard ♦♦♦♦♦

This modular, customizable keyboard has three standard modules — a cursor keypad, a numeric keypad, and a QWERTY alphanumeric keyboard — that users can rearrange to satisfy their ergonomic needs. A trackball module is optional. $239.95. DataDesk International, 9330 Eton Ave., Chatsworth, CA 91311. (800) 826-5398, (800) 592-9602 (CA), or (818) 998-4200. (Nov '90)

DEST PC Scan 3000 ♦♦♦♦

This gray-scale flatbed scanner produces sharp images with even illumination. $1,595. DEST, 1015 E. Brokaw Rd., San Jose, CA 95131. (408) 436-2700. (Sept '90)

Hewlett-Packard ScanJet Plus ♦♦♦½

This gray-scale flatbed scanner is fast and easy to use. Excellent, intuitive software. $2,190. Hewlett-Packard, 19091 Pruneridge Ave., Cupertino, CA 95014. (800) 752-0900 or (408) 725-8900. (Sept '90)

Howtek Scanmaster ♦♦♦♦

This flatbed scanner is very large and somewhat slow. Includes powerful color controls in software. Poor OCR. Requires Mac II series. $8,195. Howtek, 21 Park Ave., Hudson, NH 03051. (603) 882-5200. (Sept '90)

Howtek Scanmaster 35/II ♦♦

This slide scanner beats the other two slide scanners we tested in only one area — price. Given its slow scan times, poor color fidelity, and unfriendly software, the low price fails to compensate for its overall poor performance. Usable images can be obtained after much tweaking from an application such as Adobe Photoshop. $6,995. Howtek, 21 Park Ave., Hudson, NH 03051. (603) 882-5200. (Sept '90)

Logitech ScanMan Model 32 ♦♦♦

Logitech's sharp-looking hand-held black-and-white scanner produces excellent line art and includes the nifty ability to scan a graphic from top to bottom, from left to right, or from right to left. Its gray-scale dithering capability is a little inconsistent. $499. Logitech, 6505 Kaiser Dr., Fremont, CA 94555. (415) 795-8500. (Sept '90)

Microtek MSF-300GS ♦♦♦½

This 300-dpi flatbed scanner comes with nice software, including Digital Darkroom and Image-Studio. It can process legal-sized documents. $2,195. Microtek, 680

Knox St., Torrance, CA 90502. (213) 321-2121. (Sept '90)

Microtek MSF-300Z ♦♦♦♦

The default settings of this color/gray-scale scanner, which comes with uncomplicated software, produce rich, saturated scans. The software bundle includes Digital Darkroom, ImageStudio, and PhotoMacEdit. Requires Mac SE/30 or II series. $2,695. Microtek, 680 Knox St., Torrance, CA 90502. (213) 321-2121. (Sept '90)

Mirror VS300 ♦♦♦½

This 300-dpi monochrome overhead scanner has poor resolvability and uneven contrast but includes a nice software bundle. $797. Mirror Technologies, Inc., 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Sept '90)

Nikon LS-3500 ♦♦♦½

This color-slide scanner could use friendlier software, but its excellent resolution and wide range of controls make it a winner. Focusing and calibration are automatic. Has variable input resolution but lacks postprocessing capabilities. Requires Mac II series with 2 megabytes of RAM. $9,995; GPIB board, $495. Nikon, 1300 Walt Whitman Blvd., Melville, NY 11747. (516) 547-4200. (Sept '90)

Pentax SB-A4301 Model 2 ♦♦½

Poor gray-scale performance accounts for this gray-scale flatbed's low rating. Scans to RAM only. $1,799. Pentax Teknologies, 100 Technology Dr., Broomfield, CO 80020. (303) 460-1600. (Sept '90)

Pointer Systems FreeWheel Pointer ♦♦♦½

The FreeWheel Pointer lets users control their Mac by bouncing infrared light off a small lightweight mirror on the user's forehead. Compact receiver unit and a puff switch. The standard keyboard arrangement is visible on-screen. $1,395. Pointer Systems, Inc., One Mill St., Burlington, VT 05401. (800) 537-1562 or (802) 658-3260. (Oct '89)

Sharp JX-100 ♦♦♦½

This inexpensive portable color scanner is actually a hybrid hand-held/flatbed scanner. Good resolvability but low resolution. Scans to RAM only. Requires 4-megabyte Mac II. $995. Sharp Electronics, Sharp Plaza, Mahwah, NJ 07430. (201) 529-8200. (Sept '90)

Sharp JX-300 ♦♦♦½

This color flatbed scanner can produce realistic flesh tones as well as superior color output. Scans to RAM only. Requires 2-megabyte Mac II. $2,345. Sharp Electronics, Sharp Plaza, Mahwah, NJ 07430. (201) 529-8200. (Sept '90)

Thunderware LightningScan 400 ♦♦♦♦½

This hand-held gray-scale scanner has good hardware performance combined with innovative

software. $495. Thunderware, Inc., 21 Orinda Way, Orinda, CA 94563. (800) 445-1166 or (415) 254-6581. (Sept '90)

Truvel TZ-3 ♦♦♦♦½

The Truvel TZ-3 is a high-end gray-scale overhead scanner with exceptional resolution (900 dpi), superior halftone output, and the ability to handle large documents. Uneven illumination at edges. Scans only to RAM. $7,785. Truvel, 8943 Fullbright Ave., Chatsworth, CA 91311. (818) 407-1031. (Sept '90)

UMAX UG80 ♦♦♦½

The UMAX UG80 gray-scale flatbed scanner has excellent resolvability and gray-scale capability. Convenient to use and easy to maintain. $1,895. UMAX Technologies, 2352 Walsh Ave., Santa Clara, CA 95051. (800) 562-0311 or (408) 982-0771. (Sept '90)

Varityper 1200 ♦♦♦♦

The Varityper 1200 features high resolution. Excellent OCR capabilities and powerful software controls. The 1200 system includes an 8-megabyte Mac IIcx, a 210-megabyte hard-disk drive, and a Radius 19-inch gray-scale monitor. $29,000. Varityper, 11 Mt. Pleasant Ave., East Hanover, NJ 07936. (201) 887-8000. (Sept '90)

Wacom SD-510C Cordless Digitizer ♦♦♦♦♦

The SD-510C Cordless Digitizer uses a pressure-sensitive stylus that's much more responsive than a mouse. This light and very thin unit requires neither a cord nor a battery. The tablet connects to the modem port. Its sensing area is 6 x 9 inches. The resolution is 770 lpi at high accuracy. At $695, it includes the Pressure Paint program. Wacom, Inc., W. 115 Century Rd., Paramus, NJ 07652. (800) 922-6613 or (201) 265-4226. (June '90)

●MEDIA & MEMORY
AGA MacDISCUS DR650-SE ♦♦♦

The AGA MacDISCUS DR650-SE is a slow erasable optical drive. It easily auto-mounts (even without an INIT), and partitions can be write-protected. Support is toll-free. $3,795. AGA, 653 11th Ave., 11th Floor, New York, NY 10036. (800) 347-2871 or (212) 265-0655. (Nov '90)

AppleCD SC ♦♦♦♦

This is the drive that launched Mac CD-ROM. Although it's expensive, it's well built and offers good — but not great — speed. Audio features include RCA stereo jacks; a convenient thumbwheel volume control; and CD Remote, some of the best audio-control software available. $1,199. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Mar '90)

APS 45 MB Removable ♦♦♦

Alliance Peripheral's SyQuest drive comes in a plastic case and is bundled with 12.5 megabytes of shareware. Documentation is sparse, but the toll-free support may be all you need to keep going. With cartridge, $549; with dual cartridge, $999. Alliance Peripheral Systems, 2900 S. 291 Highway, Independence, MO 64057. (800) 233-7550 or (816) 478-8300. (Feb '91)

Bay Microsystems 300 ♦♦♦

The Bay 300 is a big hard-disk drive with an actual capacity of 291 megabytes. Its seek times are slow, and it has low throughput. $1,650. Bay Microsystems, 210 Columbus Ave., Suite 108, San Francisco, CA 94133. (415) 563-8392. (Dec '90)

Bay Microsystems 44 RePack ♦♦♦

This SyQuest-based removable-magnetic-disk-cartridge drive comes in a plastic (not metal) case and includes a one-year warranty. Documentation is well written. Bundled diagnostic software is rudimentary. With cartridge, $675; additional cartridge, $72. Bay Microsystems, Inc., 210 Columbus Ave., Suite 108, San Francisco, CA 94133. (415) 563-8392. (Feb '91)

Bay Microsystems 600RePack ♦♦♦½

The Bay Microsystems 600Re-Pack is an easy-to-use erasable optical drive with good access times. Includes few utilities. $3,600. Bay Microsystems, 210 Columbus Ave., Suite 108, San Francisco, CA 94133. (415) 563-8392. (Nov '90)

CD Technology Porta-Drive ♦♦♦♦½

This compact and versatile unit comes with a separate power supply or optional battery pack. Uses the Toshiba 3201-B mechanism, the fastest on the market. $895; battery pack, $200; PlayCD upgrade, $50. CD Technology, 780 Montague Expy., Suite 407, San Jose, CA 95131. (408) 432-8698. (Mar '90)

ClubMac 45 MB ♦♦♦

The SyQuest-based ClubMac 45 MB unit (formerly known as ClubMac 44 MB) is a removable-cartridge drive that comes in a flexible plastic case. Has a quiet fan. Supports A/UX drive partitioning. Includes cables and software. Documentation is rudimentary. Comes with a cartridge. $495. ClubMac, 7 Musick, Irvine, CA 92718. (800) 258-2622 or (714) 768-1490. (Feb '91)

CMS Enhancements MacStack SD45RM ♦♦♦

This SyQuest removable-cartridge drive comes with excellent documentation and auto-switching power supply. $999. CMS Enhancements, Inc., 2722 Michelson Dr., Irvine, CA 92715. (714) 222-6000. (Feb '91)

CMS Platinum Series PD 300 ♦♦♦

The CMS Platinum Series PD 300 is a hard-disk drive with an actual capacity of 291 megabytes. It includes good software but has slow seek times and low throughput. On the plus side, it does include good software. $3,299. CMS Enhancements, 2722 Michelson Dr., Irvine, CA 92715. (714) 222-6000. (Dec '90)

Conversion Dynamics Optirase EOD-650 ♦♦♦♦

Conversion Dynamics Optirase EOD-650 is an erasable optical drive that has a good speed rating. It has an auto-switching power supply and includes Redux software. Support is toll-free. $5,450. Conversion Dynamics, 1200 Corporate Dr., Suite 150, Birmingham, AL 35242. (205) 991-8338. (Nov '90)

Corel 50 MB Removable ♦♦♦

This metal-encased Ricoh-based magnetic-disk-cartridge drive is durable. It lacks speed, however, and documentation is sparse. Drive with kit, $1,295; kit only, $295. Corel Systems, 1600 Carling Ave., Suite 190, Ottawa, Ontario K12 8R7, Canada. (613) 728-8200. (Feb '91)

Cranel 330 MB ♦♦♦½

The Cranel 330 MB is a 321-megabyte hard-disk drive. Its seek times and throughput rate are average. It has one of the largest cases for hard-disk drives of similar capacity. Cranel provides good customer support. $2,350. Cranel, 510F E. Wilson Bridge Rd., Worthington, OH 43085. (800) 288-4375 or (614) 433-0045. (Dec '90)

Cutting Edge 44 MB Removable ♦♦♦

This sturdy, well-built SyQuest removable-cartridge drive comes in a metal case. Includes dual-fuse protection and two switched AC outlets. $1,149. Cutting Edge, 97 S. Red Willow Rd., Evanston, WY 82930. (307) 789-0582. (Feb '91)

Data Enhancements ProCase PD1045-RM ♦♦♦½

This SyQuest magnetic-disk-cartridge drive comes with powerful software. It supports A/UX drive partitioning and has a competitive speed rating. Requires Mac Plus or later. $598. Data Enhancements, Inc., 31328 Via Colinas, Unit 102, Westlake Village, CA 91362. (818) 879-2700. (Feb '91)

Data Enhancements ProSystem PS1350 ♦♦♦

The Data Enhancements ProSystem PS1350 is a hard-disk drive with a capacity of 330 megabytes. Its seek times are average, and its throughput is low. $3,189. Data Enhancements, 31328 Via Colinas, Unit 102, Westlake Village, CA 91362. (818) 879-2700. (Dec '90)

DaynaFile for NeXT ♦♦♦

The DaynaFile for NeXT floppy drive enables file transfer between DOS disks and the NeXT, as well as creation of NeXT UNIX disks. It comes in three configurations. Only the 3.5-inch model can exchange files with a Mac. It doesn't support Mac disks. 5.25-inch drive, $750; 3.5-inch drive, $850; both, $1,105. Dayna Communications, 50 S. Main, 5th Floor, Salt Lake City, UT 84144. (801) 531-0600. (Oct '90)

Deltaic Server 300Q ♦♦♦½

The Deltaic Server 300Q is actually a 326-megabyte hard-disk drive that features exceptional performance with some of the fastest seek times available. It has only average throughput, however. $2,299. Deltaic, 1701 Junction Ct., #302B, San Jose, CA 95112. (800) 745-1240 or (408) 441-1240. (Dec '90)

Deltaic Systems OptiServer 600 ♦♦♦½

The Deltaic Systems OptiServer 600 is an extremely quiet erasable optical drive with sophisticated software that maps out bad sectors and parks heads. Includes a few software utilities. $3,599. Deltaic Systems, 1701 Junction Ct., #302B, San Jose, CA 95112. (800) 745-1240 or (408) 441-1240. (Nov '90)

DPI 44 Removable ♦♦♦♦

This SyQuest removable-cartridge drive features a vertically mounted drive encased in sturdy metal. Its diode-regulated fan ensures cool operation. Comes with cartridge. $570. DPI, 47421 Bayside Pkwy., Fremont, CA 94538. (800) 825-1850 or (415) 656-8041. (Feb '91)

Denon DRD-253 ♦♦½

The ponderous performance of this CD-ROM drive makes it lag far behind many other drives. The built-in speaker is good for working with audio, but it doesn't account for the box's large size. You can also operate it as a stand-alone audio-CD player but only after you've disconnected it from the Mac and set a bank of DIP switches. It's slow and lacks audio software. $940. Denon America, 222 New Rd., Parsippany, NJ 07054. (201) 575-7810. (Mar '90)

DIT CubeFloppy 1.4 ♦♦♦½

The CubeFloppy 1.4 is a compact 3.5-inch floppy drive that reads DOS 720K and 1.4-megabyte disks. Includes capability to initialize, mount, and unmount UNIX floppies via NeXT's Shell, a command-line interface. Doesn't read or write Mac-formatted disks, but that capability is planned for the future. With software, $680; software only, $250. Digital Instrumentation Technology, Inc., 901 18th St., Suite 11000, Los Alamos, NM 87544. (505) 662-1482. (Oct '90)

Ehman 45 MB Removable ♦♦♦½

This SyQuest removable-cartridge drive is well built and reasonably priced. A standout in speed and

performance tests. Requires any Mac. $549. Ehman Engineering, Inc., 97 S. Red Willow Rd., Evanston, WY 82930. (800) 257-1666 or (307) 789-3830. (Feb '91)

Fifth Generation
FastBack Tape ‡‡‡‡½
FastBack Tape includes everything you need to back up your data in one convenient package: an FB120 tape drive, FastBack II 2.10, manuals for the tape drive and FastBack II, a SCSI terminator block, a preformatted DC2110 minicartridge, and all the necessary cables. It is costly and a little slow compared with other backup devices, but if tape is your backup of choice, you'd be hard-pressed to find a more polished product. $1,395. Fifth Generation Systems, 10049 N. Reiger Rd., Baton Rouge, LA 70809. (800) 873-4384 or (504) 291-7221. (July '90)

FWB HammerDisk44 ‡‡‡‡½
The SyQuest-based Hammer-Disk44 is a pricey, high-quality storage unit. It features a metal case, a well-designed power supply, external SCSI termination, an effective cooling system, high-quality formatting software, and easy-to-use documentation. Outstanding speed. $1,395. FWB, 2040 Polk St., Suite 215, San Francisco, CA 94109. (415) 474-8055. (Feb '91)

FWB Hammer 300 ‡‡‡‡½
The compact FWB Hammer 300 is a hard-disk drive with an actual capacity of 323 megabytes. Highly recommended as a network server because of its superquick seek times and high throughput, this drive just missed a five-mouse rating because of its undistinguished proprietary software and generic metal case. $3,495. FWB, 2040 Polk St., Suite 215, San Francisco, CA 94109. (800) 474-8055 or (415) 474-8055. (Dec '90)

FWB HammerDisk 600 ‡‡‡‡
This Ricoh-based erasable optical drive attained very competitive speeds. Includes numerous software utilities. $4,995. FWB, 2040 Polk St., Suite 215, San Francisco, CA 94109. (800) 474-8055 or (415) 474-8055. (Nov '90)

FWB HammerDisk 600S ‡‡‡‡½
The Sony-based FWB Hammer-Disk 600S has one of the best speed ratings for erasable optical drives. Sophisticated software overrides copy protection. The only drawback to this nice machine is the lack of an auto-eject function on dismount or shutdown. $5,495. FWB, 2040 Polk St., Suite 215, San Francisco, CA 94109. (800) 474-8055 or (415) 474-8055. (Nov '90)

GCC UltraDrive 430S ‡‡‡‡‡
The GCC UltraDrive 430S is a high-throughput hard-disk drive with an actual capacity of 428 megabytes. Highly recommended for storing large database, graph-

ics, sound, or animation files, because of its excellent throughput scores and average seek times. It includes a QuickDraw print spooler, SUM II, 3.5 megabytes of public-domain software, and its own envelope-printing utility. Support is also good. $2,699. GCC Technologies, 580 Winter St., Waltham, MA 02154. (800) 422-7777 or (617) 890-0880. (Dec '90)

Hard Drives International PowerDrive 44 ‡‡‡½
This SyQuest magnetic-disk-cartridge drive comes with good software. It has a sturdy metal case, but no shielding on SCSI connectors. With cartridge, $575; additional cartridge, $79. Hard Drives International, 1912 W. Fourth St., Tempe, AZ 85281. (800) 733-3473 or (602) 350-1128. (Feb '91)

HDI POWERDrive 320 ‡‡‡½
The HDI POWERDrive 320 is a hard-disk drive with an actual capacity of 330 megabytes. It has average seek times and throughput. $1,499. Hard Drives International, 1912 W. Fourth St., Tempe, AZ 85281. (800) 733-3473 or (602) 350-1128. (Dec '90)

IDS VPS340 ‡‡‡½
The IDS VPS340 is a hard-disk drive with a capacity of 330 megabytes. Its seek times and throughput are average. Its plastic case is small. $2,995. IDS, 2107 N. First St., Suite 280 Koll Bayshore Bldg., San Jose, CA 95131. (800) 733-0078. (Dec '90)

Iomega Transportable 44 ‡‡‡½
If you need maximum reliability in a removable-cartridge drive and don't mind its higher price, extra weight, and slower speed, this Bernoulli drive is an excellent portable-storage choice. It is best for data transport, storage, and backup rather than frequent spinning. Special cache capability improves speed. Works under MultiFinder, meaning that formatting can occur in the background. $1,399. Iomega Corp., 1821 W. 4000 S., Roy, UT 84067. (800) 456-5522 or (801) 778-1000. (Feb '91)

La Cie 45 MB Removable ‡‡‡‡
This SyQuest drive is solidly built and features an auto-switching power supply. Its powerful formatting software offers a variety of options. Silver Platter and Norton Utilities for Macintosh are bundled with it. $799. La Cie, Ltd., 19552 S.W. 90th Ct., Tualatin, OR 97062. (800) 999-0143 or (503) 691-0771. (Feb '91)

La Cie 600R Magneto-Optical ‡‡‡‡
The La Cie 600R Magneto-Optical is one of several solid erasable optical speed champs. Good access times. Its formatting software is optimized for fast SCSI performance. Includes Silverlining disk-management software.

$4,149. La Cie, 19552 S.W. 90th Ct., Tualatin, OR 97062. (800) 999-0143 or (503) 691-0771. (Nov 90)

La Cie ZFP 400 ‡‡‡‡‡
The La Cie ZFP 400 is a high-throughput hard-disk drive with a capacity of 423 megabytes. Highly recommended for storing large database, graphics, sound, or animation files, because of its superior throughput and average seek times. It comes bundled with 5 megabytes of public-domain software, Silverlining disk-management software, and Norton Utilities for Macintosh for drive maintenance and repair. Of all the high-capacity drives, it's the price/performance champ, its only flaw being internal termination. Support is good too. $1,999. La Cie, 19552 S.W. 90th Ct., Tualatin, OR 97062. (800) 999-0143 or (503) 691-0771. (Dec 90)

MacLand SyQuest 42 megabyte ‡‡‡
This SyQuest-based drive has shining performance and offers an inexpensive, fast storage alternative. Includes archiving and restoration utilities. Comes with a cartridge. $514. MacLand, Inc., 4685 S. Ash Ave., Suite H5, Tempe, AZ 85282. (800) 333-3353 or (602) 820-5802. (Feb '91)

MacProducts Magic 380 ‡‡½
The MacProducts Magic 380 is a hard-disk drive with an actual capacity of 325 megabytes. Don't be tempted by the price of this relatively inexpensive drive. Its operation is quite slow, and it's difficult to set up, because of its software SCSI-ID detection, internal termination, and unshielded 25-pin SCSI connectors. $1,395. MacProducts, 8303 Mopac Expy., #218, Austin, TX 78759. (800) 622-3475 or (512) 343-9441. (Dec '90)

MacTel Index 45 Removable ‡‡‡‡
The MacTel Index 45 Removable is a SyQuest-based removable-cartridge unit (formerly known as the MacTel 45 Removable) that supports A/UX partitioning. Excellent software includes Back-Matic and AutoSave II. $669. MacTel Technology Corp., 3007 N. Lamar, Austin, TX 78705. (800) 950-8411 or (512) 451-2600. (Feb '91)

MacTown DataStor HM44/25MR ‡‡½
This SyQuest-based magnetic-disk-cartridge drive (formerly known as the Computer Products Data Stor DS44/25MR) includes only rudimentary software and documentation. On the positive side, it has a quiet fan. Includes cartridge. Plastic case. $569. MacTown, 4657 MacArthur Ln., Boulder, CO 80303. (800) 338-4273. (Feb '91)

MacProducts USA Magic 45 ‡‡‡‡
The Magic 45 is one of the best

SyQuest drives available, offering high speed and high quality. Its documentation is somewhat outdated. $499; cartridge, $69. MacProducts USA, 8303 Mopac Expy., #218, Austin, TX 78759. (800) 622-3475 or (512) 343-9441. (Feb '91)

Mass Microsystems DataPak 45 ‡‡‡‡
This SyQuest magnetic-disk-cartridge drive includes excellent documentation. It's bundled with Disk Doubler. Includes two switched AC outlets. $1,199. Mass Microsystems, 810 W. Maude Ave., Sunnyvale, CA 94086. (800) 522-7979 or (408) 522-1200. (Feb '91)

MicroNet Micro/Optical SB-SMO-1 ‡‡‡‡
The MicroNet Micro/Optical SB-SMO-1 erasable optical drive gets good marks for speed, enhanced by the drive's ability to turn off the verify pass while writing. Good access times. Includes ability to combine many discs into a single volume. $4,995. MicroNet Technology, Inc., 20 Mason, Irvine, CA 92718. (714) 837-6033. (Nov '90)

MicroNet MR45 ‡‡‡‡
The SyQuest-based MicroNet MR45 removable-cartridge drive is a good storage choice. It offers excellent documentation, very powerful software, and a well-shielded power supply. Its interface is one of the best available. With cartridge, $995; with Retrospect Remote, $1,195. MicroNet Technology, Inc., 20 Mason, Irvine, CA 92718. (714) 837-6033. (Feb '91)

MicroNet MS-404 ‡‡‡‡‡
The MicroNet MS-404 is a hard-disk drive with a capacity of 423 megabytes. The custom-designed sturdy metal case has excellent workmanship. This unit is highly recommended for storing large database, graphics, sound, or animation files, because of its high throughput and average seek times. The only software that is bundled with the drive is a proprietary installation utility. $3,795. MicroNet Technology, Inc., 20 Mason, Irvine, CA 92718. (714) 837-6033. (Dec '90)

Microtech N320 ‡‡‡‡
The Microtech N320 is a hard-disk drive with a capacity of 330 megabytes. It has average seek times and throughput and comes in a small plastic case. Its software is good, as is support. $2,299. Microtech International, Inc., 158 Commerce St., East Haven, CT 06512. (800) 626-4276 or (203) 468-6223. (Dec '90)

Microtech OR650 ‡‡‡
This erasable optical drive's performance is slow. It comes with Total Recall software, which lets you perform unattended backups. It also includes Norton Utilities for Macintosh. $4,795. Microtech International, Inc. 158 Commerce

St., East Haven, CT 06512. (800) 626-4276 or (203) 468-6223. (Nov '90)

Microtech R50 ♦♦♦♦
The Microtech R50 is a Ricoh-based removable-cartridge-drive speed champion. Of all the Ricoh-based drives, the R50 is highly recommended, because of its excellent formatting software and useful utilities. Comes with two SCSI cables. With cartridge, $1,299; extra cartridge, $129. Microtech International, Inc., 158 Commerce St., East Haven, CT 06512. (800) 626-4276 or (203) 468-6223. (Feb '91)

Mirror MP290 ♦♦♦½
The Mirror MP290 is a 291-megabyte hard disk with slow seek times and low throughput. DIP switches. Comes in a large metal case. $1,757. Mirror Technologies, 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Dec '90)

Mirror RM42 ♦♦♦♦
The SyQuest-based RM42 is a sturdy removable-cartridge-drive system in a metal case. It is bundled with QuicKeys, DiskTop, Mock-Package+, and 10 megabytes of public-domain software. $677. Mirror Technologies, 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Feb '91)

Mirror RM600 Optical ♦♦♦
The Mirror RM600 Optical's software allows manual sector mapping. It also includes an auto-eject function at dismount or shutdown. Its performance is slow. $3,497. Mirror Technologies, 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Nov '90)

NEC Intersect CDR-35 ♦♦½
The Intersect CDR-35 is a portable CD-ROM drive that can also double as a portable CD player. Unfortunately it has many flaws, such as only one SCSI connector, no way of changing the SCSI address, and almost nonexistent documentation — and you can't stop the drive manually to remove a CD after a system crash. Look at the Toshiba portable CD-ROM drives instead. $499. NEC Technologies, Inc., 1414 Massachusetts Ave., Boxborough, MA 01719. (800) 632-4636 or (508) 264-8000. (Sept '90)

Neoteric Genesis 6000i ♦♦♦♦
This erasable optical drive (formerly available from MACsetra Technologies) features good speed and software. Other highlights include a fast erase function and a filtered fan. Includes the capability to combine many discs into a single volume. $5,495. Neoteric Systems, Inc., 350 Second Ave., S. Saskatoon, Saskatchewan S7L 1L1, Canada. (800) 667-5488 or (306) 665-6000. (Nov '90)

Ocean Microsystems Tidalwave 650 ♦♦♦♦
The Ocean Microsystems Tidal-

wave 650 is a solid product, offering high speed and quality performance in an erasable optical drive. It includes MacTools Deluxe and a program that mounts Ocean drives on a SCSI bus. $4,195. Ocean Microsystems, 246 E. Hacienda Ave., Campbell, CA 95008. (800) 262-3261 or (408) 374-8300. (Nov '90)

Ocean Totem IV 44MB ♦♦♦½
This Bernoulli-based magnetic-disk-cartridge drive features a unique vertical metal case. Because of an extensive verification scheme, the drive's operation is a little slow. However, it's well designed and an excellent choice if reliability is your top priority. Comes with a cartridge. $1,350; Totem IIID dual, $2,350. Ocean Microsystems, Inc., 246 E. Hacienda Ave., Campbell, CA 95008. (800) 262-3261 or (408) 374-8300. (Feb '91)

Optima MiniPak 310 ♦♦♦♦
The Optima MiniPak 310 is a pricey 311-megabyte hard-disk drive featuring slow seek times. It has a small plastic case and good software. $4,395. Optima Technology, 17526 Von Karman, Irvine, CA 92714. (714) 476-0515. (Dec '90)

Pacific Microelectronics PM1.44 Floppy Drive ♦♦♦
The PM1.44 Floppy Drive is a floppy-disk drive for NeXT machines that can read and write DOS-formatted 720K, UNIX 1.4-megabyte and Mac 1.4-megabyte disks. Nicely designed, with a shape that fits exactly beneath the NeXT cube. $395. Pacific Microelectronics, 201 San Antonio Circle, C250, Mountain View, CA 94040. (800) 628-3475 or (415) 948-6200. (Oct '90)

Pinnacle REO-650 ♦♦½
The Pinnacle REO-650 is an erasable optical drive with average speed, but new cache software should improve performance. It has an A/UX option and a voltage selector but only a few utilities. $4,695. Pinnacle Micro, 15265 Alton Pkwy., Irvine, CA 92718. (800) 553-7070. or (714) 727-3300. (Nov '90)

PLI Infinity Optical ♦♦♦♦
The PLI Infinity Optical is among the five fastest erasable optical drives. Its A/UX option allows 1,024 bytes to be allocated to a sector. It includes the TurboSpool print spooler and a vertical stand. $5,695. PLI, 47421 Bayside Pkwy., Fremont, CA 94538. (800) 288-8754 or (415) 657-2211. (Nov '90)

PLI PL320F Turbo ♦♦♦♦
The PLI PL320F Turbo is a 320-megabyte hard-disk drive that had some of the fastest seek times of the drives we tested. It has only average throughput. It comes in a large metal case, and customer support is good. $4,395. PLI, 47421 Bayside Pkwy., Fremont, CA 94538. (800) 288-8754 or

(415) 657-2211. (Dec '90)

PLI Infinity 40 Turbo Enhanced ♦♦♦♦
This SyQuest-based unit (formerly known as the Infinity 40 Turbo) is an outstanding choice in magnetic-disk-cartridge drives, offering excellent formatting software, useful utilities, and some great programs for automating backup. $1,199. PLI, 47421 Bayside Pkwy., Fremont, CA 94538. (800) 288-8754 or (415) 657-2211 (Feb '91)

Procom MD 320 ♦♦♦♦
The Procom MD 320 is a 323-megabyte hard-disk drive that features fast seek times and high throughput. $3,295. Procom Technology, 200 McCormick Ave., Costa Mesa, CA 92626. (714) 549-9449. (Dec '90)

Procom MEOD650 ♦♦♦
This erasable optical drive is very slow. It has 25-pin SCSI connectors and comes with Retrospect backup software. $4,495. Procom Technology, Inc., 200 McCormick Ave., Costa Mesa, CA 92626. (714) 549-9449. (Nov '90)

RACET Cosmos SA600MO-II ♦♦♦
This erasable optical drive can perform an unattended backup with an archive log but has slow performance. The included software can combine many discs into a single volume. $4,795. RACET computes, 3150 Birch St., Brea, CA 92621. (714) 579-1725. (Nov '90)

RACET SA350 ♦♦♦♦
The RACET SA350 is a 349-megabyte hard-disk drive. It features some of the fastest seek times among comparable drives, but has only average throughput. $3,115. RACET computes, 3150 Birch St., Brea, CA 92621. (714) 579-1725. (Dec '90)

Relax Hard 300 Plus ♦♦♦
The Relax Hard 300 Plus is a 291-megabyte hard-disk drive with average seek time and throughput. Has a switched power center. $2,679. Relax Technology, 3101 Whipple Rd., Union City, CA 94587. (800) 848-1313 or (415) 471-6112. (Dec '90)

Relax Mobile 42 ♦♦♦½
The Mobile 42 is a SyQuest-based magetic-disk-cartridge drive. Includes an auto-switching power supply and a built-in surge protector. The formatting software is powerful but difficult to use. Very quiet fan. Comes with a cartridge. $529. Relax Technology, Inc., 3101 Whipple Rd., Union City, CA 94587. (800) 848-1313 or (415) 471-6112. (Feb '91)

Relax Optical 600 Plus ♦♦♦½
The compact Relax Optical 600 Plus is an erasable optical drive with built-in power control, surge protection, and noise filtering. $4,399. Relax Technology, 3101 Whipple Rd., Union City, CA 94587. (800) 848-1313 or (415) 471-6112. (Nov '90)

Rodime R45 Plus ♦♦½
This SyQuest removable-cartridge drive lacks extra features and comes in a flexible plastic case. Its speed is a plus. $1,399. Rodime Systems, Inc., 901 Broken Sound Pkwy. N.W., Boca Raton, FL 33487. (800) 688-9390 or (407) 994-5585. (Feb '91)

Rodime Systems Cobra 330e ♦♦♦♦
The Rodime Systems Cobra 330e is a 345-megabyte hard-disk drive with slow seek times and average throughput. Two AC outlets are located on the back. $3,990. Rodime Systems, 901 Broken Sound Pkwy. N.W., Boca Raton, FL 33487. (800) 688-9390 or (407) 994-5585. (Dec '90)

Ruby Systems StarDrive 45RX ♦♦♦
The SyQuest-based StarDrive is a little slow and a little pricey. It includes excellent documentation and an extensive troubleshooting guide. It has a metal case. $995. Ruby Systems, Inc., 930 Thompson Pl., Sunnyvale, CA 94086. (800) 888-1668 or (408) 735-8668. (Feb '91)

Storage Dimensions MacinStor MCE 880-HC1 ♦♦♦♦½
The MacinStor MCE 880-HC1 (formerly known as the Macin-Stor) offers the largest storage capacity — 1 gigabyte — available. It features an outstanding read rate, making it ideal for read-intensive applications. The non-standard format that gives it 1-gigabyte capacity can't be read by other drives, however, so don't plan to use cartridges with this format in other manufacturers' drives. In standard mode, the MacinStor can format, read, write, and erase a 650-megabyte cartridge, but its performance suffers when it uses this type of cartridge. Package includes Retrospect backup software. $7,995. Storage Dimensions, 2145 Hamilton Ave., San Jose, CA 95125. (408) 879-0300. (Nov '90)

Storage Dimensions 325-S1 ♦♦♦♦
The Storage Dimensions 325-S1 is a high-throughput, superquick 326-megabyte hard-disk drive with excellent seek times. Highly recommended as a network server. It has a large custom plastic case — the front pops off to reveal that the unit is prewired to accept a second mechanism in the same housing. This is a nice option if you need to add more storage capacity in the future. $3,499. Storage Dimensions, 2145 Hamilton Ave., San Jose, CA 95125. (408) 879-0300. (Dec '90)

Sumo SSER 50 Removable ♦♦♦½
The Sumo SSER50 is a slow Ricoh-based removable-cartridge drive that comes in a sturdy metal case. It supports A/UX partitions and provides unlimited

data storage in 50-megabyte increments. Good documentation. $1,300. Sumo Systems, 1580 Old Oakland Rd., Suite C-103, San Jose, CA 95131. (408) 453-5744. (Feb '91)

Sumo Systems RSSM600-B ♦♦♦

The Sumo RSSM600-B is a slow erasable optical drive with meager software. Its default format is not ISO. Includes an Option-key sequence to format it as ISO standard. $4,300. Sumo Systems, 1580 Old Oakland Rd., Suite C-103, San Jose, CA 95131. (408) 453-5744. (Nov '90)

SuperMac DataFrame XP330 ♦♦♦½

The SuperMac DataFrame XP330 is a 322-megabyte hard-disk drive that has slow seek times and average throughput. Its software is good. $3,599. SuperMac Technology, 485 Potrero Ave., Sunnyvale, CA 94086. (408) 245-2202. (Dec '90)

Technology Works 3-Meg Static RAM Card ♦♦♦♦♦

The 3-MB Static RAM Card is an excellent — even necessary — addition to every Macintosh Portable. It uses no extra power and allows maximum operating speed. In a side-by-side comparison, the Mac equipped with the static RAM ran slightly faster and the battery lasted longer in Sleep mode. Easy to install and has a lifetime warranty. Requires Mac Portable. $995. Technology Works, 4030 Braker Lane W., Suite 350, Austin, TX 78759. (800) 688-7466 or (512) 794-8533. (Oct '90)

Tecmar DATaVault ♦♦♦♦

DATaVault is a backup unit that uses a Wangtek 4-millimeter DAT unit and can hold 1 gigabyte of data. $4,995. Tecmar, 6225 Cochran Rd., Solon, OH 44139. (216) 349-0600. (July '90)

Tecmar THS-2200 ♦♦♦♦

The THS-2200 is a tape-backup unit whose average transfer rate is 129.21K per second. $6,995. Tecmar, 6225 Cochran Rd., Solon, OH 44139. (216) 349-0600. (July '90)

Third Wave 45R ♦♦♦½

The Third Wave 45R is a SyQuest removable-cartridge drive that comes with an auto-switching power supply. It's bundled with Fontina utilities, 12 megabytes of shareware, and HyperDeck. $629. Third Wave Computing, Inc., 1826-B Kramer Ln., Austin, TX 78758. (800) 284-0486 or (512) 832-8282. (Feb '91)

Toshiba XM-3201 A1 MAC ♦♦♦♦½

Toshiba's XM-3201 A1 MAC is a very solidly built unit that uses a fast drive mechanism. Fast, exceptional performance. No power indicator. $970. Toshiba, 9740 Irvine Blvd., Irvine, CA 92718. (800) 334-3445 or (714) 583-3000. (Mar '90)

Total Peripherals TP-44R ♦♦♦

The TP-44R offers speed at a reasonable price. Includes an auto-switching power supply. Documentation is rudimentary, and the fan is noisy. $799. Total Peripherals, Inc., 1 Brigham St., Marlboro, MA 01752. (508) 460-0764. (Feb '91)

Univation Q50 ♦♦½

The Q50 is a Ricoh-based magnetic-disk-cartridge drive. Has rudimentary software. The fan can scrape if the power cable is stressed because of poor positioning. Processing is somewhat slow. $1,395. Univation, 600 Valley Way, Milpitas, CA 95035. (408) 263-1200. (Feb '91)

Xyxis XY600RW ♦♦♦

The Xyxis XY600RW is an erasable optical drive with very slow performance. Its bundled software includes dynamic partitioning. $5,245. Xyxis, 14631 Martin Dr., Eden Prairie, MN 55344. (612) 949-2388. (Nov '90)

●OUTPUT DEVICES

Agfa P3400PS ♦♦½

The high-end 400-dpi Agfa P3400PS PostScript laser printer is one of the fastest models available but earns poor marks in image quality. This 12-ppm workhorse has two standard trays for 250 sheets each. Includes 20-megabyte hard-disk drive that contains 60 of its 73 fonts. The remaining 13 are stored in ROM. $9,995. Agfa Compugraphic, 200 Ballardvale St., Wilmington, MA 01887. (800) 227-2780 or (508) 658-5600. (Oct '90)

Apple ImageWriter LQ Printer ♦♦½

The Apple ImageWriter LQ produces letter-quality text and graphics at 216 dpi in as many as seven colors (using an optional ribbon). It is limited to four fonts in 12 sizes. Networkable. Printer driver, version 2.0. Requires 1 megabyte of RAM. $1,399. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Jan '89)

Apple LaserWriter IINT ♦♦♦

The 300-dpi, 8-ppm PostScript LaserWriter IINT is beginning to show its age in price and performance. This midpriced PostScript laser printer is faster than the LaserWriter Plus and produces blacker blacks. Too slow for networks. $4,499. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Oct '90)

Apple LaserWriter IINTX ♦♦♦♦

This 300-dpi, 8-ppm PostScript laser printer sets the standard for price and performance. Its 68020 chip makes it very speedy. It is expandable to 12 megabytes, and a SCSI hard-disk drive can be attached for fonts. Lacks paper-feed options. $5,999. Apple Computer, Inc., 20525 Mariani

Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Oct '90)

Apple Personal LaserWriter NT ♦♦♦♦

This laser printer has a large paper tray, an attractive design, and decent speed. $3,299. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Oct '90)

Apple Personal LaserWriter SC ♦♦♦♦

The Apple Personal LaserWriter SC is a 300-dpi QuickDraw printer that produces near-laser-printer quality at a bargain price. For simple graphics and text output, it rivals the quality of higher-priced PostScript printers. Easy-to-use, well-designed toner cartridge. $1,999; Personal LaserWriter IINT board upgrade, $1,300. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Nov '90)

CalComp PlotMaster 5902A ♦♦

The CalComp PlotMaster 5902A color thermal-wax-transfer printer is one of the slowest on the market. Its print quality is mediocre, and its color gradation is poor. Optional parallel interface and plotter emulation. Requires CA-Cricket Expression driver. $5,595. CalComp, 2411 W. La Palma Ave., Anaheim, CA 92801. (800) 225-2667. or (714) 821-2000. (May '90)

CoStar LabelWriter ♦♦♦♦

The LabelWriter is a tiny thermal printer that prints labels one at a time. You can set font, size, style, and justification, but these attributes apply to the entire label. A memory feature lets you easily store commonly used labels for quick retrieval. Chooser-selectable drive is promised for future versions. This is an addictive and time-saving device. It comes with two Casady & Greene fonts and one roll of labels; CoStar sells additional rolls for about 5 cents a label. Requires Mac Plus or later. $249.95. CoStar Corp., 22 Bridge St., Greenwich, CT 06830. (800) 426-7827 or (203) 661-9700. (May '90)

Dataproducts LZR 1260i ♦♦♦♦½

This 300-dpi, 12-ppm PostScript laser printer is an ideal business printer. Its overall speed is rivaled only by that of the Apple LaserWriter IINTX and the QMS-PS 810 Turbo, but for straight text output, its 12-ppm engine gives it the edge. It produces image quality that is consistently above average in its class. The LZR 1260i has a 250-page paper tray and offers a myriad of paper-handling options. It has a parallel interface in addition to serial and LocalTalk ports, which makes it well suited to PC/Mac mixed-platform environments. $5,995. Dataproducts,

6200 Canoga Ave., Woodland Hills, CA 91367. (818) 887-8000. (Oct '90)

Eastman-Kodak XL7700 Digital Continuous Tone Printer ♦♦♦♦½

The XL7700 is a color printer whose output is so good that it looks like original photos. This unit sets a new standard for color printing. Its dye-sublimation process makes continuous-tone prints. The only drawback is the high cost of the printer and printing media. $24,895. Eastman-Kodak, 343 State St., Rochester, NY 14650. (800) 445-6325. (Jan '91) ★ '90 Eddy

Fujitsu RX7100PS+ ♦♦♦

Fujitsu's RX7100PS+ is a 300-dpi, 5-ppm laser printer that has faster performance than an Apple LaserWriter IINT, but is still too slow to accommodate networks comfortably. Includes two paper bins and QuickLetter and Select-A-Bin software. $3,995. Fujitsu America, 3055 Orchard Dr., San Jose, CA 95134. (408) 432-1300. (Oct '90)

GCC PLP IIS ♦♦♦♦½

One of the best laserlike personal printers, the GCC PLP IIS features excellent image quality and speedy output. For simple graphics and text output, it rivals higher-priced PostScript printers. It's sturdily built and includes good bundled software and outline fonts. Can be upgraded to PostScript. $1,899. GCC Technologies, 580 Winter St., Waltham, MA 02154. (800) 422-7777 or (617) 890-0880. (Nov '90)

GCC WriteImpact ♦♦♦♦

This dot-matrix impact printer produces near-letter-quality output. It includes 25-to-400 percent enlargement and reduction, print preview, smoothing, and kerning features. It's excellent at paper handling, offering both push and pull tractor feed as well as friction feed. Adobe and Bitstream fonts are supported. Performance is very good — equaling that of the ImageWriter LQ without the high price. The only major drawback with this printer is that it's a serial device with no networkable AppleTalk version. GCC Technologies, Inc., 580 Winter St., Waltham, MA 02154. (800) 422-7777 or (617) 890-0880. (June '90)

GCC WriteMove ♦♦♦

The three-pound WriteMove is one of the smallest, lightest Mac printers available. It's an inkjet unit that produces resolutions of up to 192 dpi. It can run off rechargeable batteries or AC and comes with a good selection of Bitstream fonts. Printing quality varies widely, depending on the paper and ink used. Version 1.0 reviewed; printer driver version 1.3 shipping. Requires Mac Plus or later and a hard-disk drive. $549. GCC Technologies, Inc., 580

Winter St., Waltham, MA 02154. (800) 422-7777 or (617) 890-0880. (Apr '89)

Hewlett-Packard DeskWriter
$$ \frac{1}{2}

The compact, light DeskWriter is the Mac version of HP's DOS-compatible inkjet printer, a high-quality personal printer with a nice price. For simple graphics and text output, it rivals higher-priced PostScript printers. Complicated graphics can cause pages to become oversaturated with ink. $995. Hewlett-Packard, 19091 Pruneridge Ave., Cupertino, CA 95014. (800) 752-0900 or (408) 725-8900. (Nov '90)

Hewlett-Packard LaserJet III
$$ ½

For less money than a LaserWriter IINT costs, the 300-dpi, 8-ppm LaserJet III produces text resolution that almost rivals that of higher-resolution printers. PostScript cartridge includes ATM font rasterizer and 35 outline fonts. $2,395; PostScript option, $695; Mac interface, $275. Hewlett-Packard, 19091 Pruneridge Ave., Cupertino, CA 95014. (800) 752-0900 or (408) 725-8900. (Oct '90)

Hewlett-Packard LaserJet IID
$$

The 300-dpi, 8-ppm Hewlett-Packard LaserJet IID is the ultimate paper handler, offering everything from two paper bins (each with a 200-sheet capacity) to automatic printing on both sides of a page. The IID could use a more powerful processor but is a contender in the corporate market. PostScript cartridge includes ATM font rasterizer and 35 outline fonts. Optional upgrade includes 2 megabytes of RAM, PostScript, and LocalTalk. $2,800; Mac interface, $275. Hewlett-Packard Peripherals Group, 16399 W. Bernardo Dr., San Diego, CA 92127. (408) 725-8900. (Oct '90)

Hewlett-Packard LaserJet IIP
$$

The low-priced, 300-dpi LaserJet IIP, with its 4-ppm Canon LBP-LX engine, is too slow for Mac PostScript printing. PostScript cartridge includes ATM font rasterizer and 35 outline fonts. $2,800; Mac interface $275. Hewlett-Packard Peripherals Group, 16399 W. Bernardo Dr., San Diego, CA 92127. (408) 725-8900. (Oct '90)

Hewlett-Packard PaintJet
$$

HP's color inkjet printer is slow, and its image quality is below average. Limited color range but convenient ink cartridges. Requires Mac Printkit. $1,395; Mac Printkit, $125. Hewlett-Packard, 19091 Pruneridge Ave., Cupertino, CA 95014. (800) 752-0900 or (408) 725-8900. (May '90)

Hewlett-Packard PaintJet XL
$$ ½

The Hewlett-Packard PaintJet XL

has low-resolution QuickDraw (180 dpi) quality but produces good-looking output. Not all colors can be reproduced. It's fast. Paper handling is good, and it can handle B-sized sheets. $2,495; MacPrintkit, $125. Hewlett-Packard 19091 Pruneridge Ave., Cupertino, CA 95014. (800) 752-0900 or (408) 725-8900. (May '90)

Kyocera Q-8010
$$

This 300-dpi, 10-ppm PostScript-clone printer is fast with text but slow with graphics, making it a good choice for users who are interested in speedy output of word-processing documents or spreadsheets. It can receive data through three active ports — serial, parallel, and LocalTalk — simultaneously. The Kyocera accepts PostScript or PCL, which is nice for mixed PC/Mac networks. Intelligent port and emulation switching. $6,995; legal-size-paper tray, $95. Kyocera Unison, 1321 Harbor Bay Pkwy., Alameda, CA 94501. (415) 748-6680. (Oct '90)

Lasergraphics CPS
$$

This QuickDraw-based color thermal-wax-transfer printer features speedy output but only mediocre print quality and low dpi. Includes MacRascol. $7,495. Lasergraphics, 20 Ada Ave., Irvine, CA 92718. (714) 727-2651. (May '90)

LaserMAX 1000
Personal Typesetter $$

This 8-ppm PostScript-clone laser printer claims resolutions as high as 1,000 dpi. It has above-average performance, but also has some PostScript-compatibility problems. Requires Mac II series. $7,995. LaserMAX Systems, 7150 Shady Oak Rd., Eden Prairie, MN 55344. (612) 944-9085. (Oct '90)

MacProducts MagicPrint $$ ½

This 300-dpi, 6-ppm personal PostScript clone is a good buy if you don't need Type 1 compatibility. It is among the fastest performers in handling graphics files. Liquid-crystal-shutter engine produces good image quality. $2,997. MacProducts USA, Inc., 8303 Mopac Expy., Suite 218, Austin, TX 78759. (800) 622-3475 or (512) 343-9441. (Oct '90)

Mirror Technologies Mirror Image $$ ½

This 300-dpi, 6-ppm PostScript-clone printer is a good buy if you don't need Type 1 compatibility. Among the fastest performers in handling graphics files. Liquid-crystal-shutter engine produces good image quality. $2,997. Mirror Technologies, Inc., 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Oct '90)

Mitsubishi G370-10 $$ ½

This compact QuickDraw-based color thermal-wax-transfer printer features excellent image quality

but lacks a hardware/software interface. $5,995. Mitsubishi Electronics America, 991 Knox St., Torrance, CA 90502. (213) 217-5732. (May '90)

Mitsubishi Shinko CHC-345
$$

This product's most distinguishing characteristic is its excellent image quality. Unfortunately, limited color range and below-average resolution mar an otherwise-nice QuickDraw-based color thermal-wax-transfer printer. $6,000. Mitsubishi International Corp., 701 Westchester Ave., White Plains, NY 10604. (914) 997-4999. (May '90)

Mitsubishi S340-10 $$$

The beautiful prints produced by Mitsubishi's QuickDraw-based color dye-sublimation printer make this printer the clear choice for the color-proofing crowd. Excellent gradation. Mediocre color range. Lacks hardware/software interface. $13,995. Mitsubishi Electronics America, 991 Knox St., Torrance, CA 90502. (213) 217-5732. (May '90)

NEC Silentwriter LC 890XL
$$ ½

This 300-dpi, 8-ppm PostScript printer is fast and flexible but produces poor-quality images — due in part to its LED engine. Includes two 250-sheet paper bins. $5,995. NEC Technologies, Inc., 1414 Massachusetts Ave., Boxborough, MA 01719. (800) 632-4636 or (508) 264-8000. (Oct '90)

NEC Silentwriter2 290 $$

This 300-dpi, 8-ppm personal PostScript laser printer boasts a compact design and some of the fastest processing speed for printers in its class. It's not, however, less noisy than its peers, despite its name. $4,495. NEC Technologies, Inc., 1414 Massachusetts Ave., Boxborough, MA 01719. (800) 632-4636 or (508) 264-8000. (Oct '90)

NewGen TurboPS/480 $$ ½

This 8-ppm PostScript-clone printer features turbocharged resolution (800 x 400 dpi) and excellent image quality. It has some PostScript-compatibility problems but lots of potential. $7,495. NewGen Systems Corp., 17580 Newhope St., Fountain Valley, CA 92708. (714) 641-8600. (Oct '90)

Océ Graphics 5232 CPS
Color PS $$

This 300-dpi color PostScript thermal-wax transfer printer features a wide color gamut and high text resolution. Precise and clear when printing text or hairlines but less competent with color gradation. Uses plastic ink. $15,990. Océ/Schlumberger Graphics, 385 Ravendale Dr., Mountain View, CA 94039. (800) 537-7568 or (415) 964-7900. (May '90)

PrintWare 720 IQ Professional
Laser Imager $$

PrintWare's 720 IQ Professional

Laser Imager produces excellent-quality images. Of the high-resolution clone printers, it is the most compatible with PostScript, but it's very slow. $11,990. Printware, 1385 Mendota Heights Rd., Minneapolis, MN 55120. (800) 456-1400 or (612) 456-1400. (Oct '90)

QMS ColorScript 100
Model 10 $$$

Simple to install and use, the QMS ColorScript thermal-wax-transfer PostScript printer features good print quality and speedy output. Excellent software. $8,995. QMS, Inc., One Magnum Pass, Mobile, AL 36689. (800) 523-2696 or (205) 633-4300. (May '90) ★ '89 Eddy

QMS PS-410 Turbo $$$ ½

This low-priced personal printer leads the way in innovation and bang for buck. It features an extremely fast processing capability and provides an ideal solution for mixed-platform environments, in that it can accept data from all three ports simultaneously and automatically switch among printer languages. $2,795. QMS, Inc., One Magnum Pass, Mobile, AL 36689. (800) 523-2696 or (205) 633-4300. (Mar '91) ★ '90 Eddy

QMS PS-810 Turbo $$$

The 300-dpi, 8-ppm QMS PostScript laser printer ranks high on speed charts, processing good-quality graphics faster than comparable printers. Includes parallel interface. RAM-expansion capability up to 3 megabytes. $5,495. QMS, Inc., One Magnum Pass, Mobile, AL 36689. (800) 523-2696 or (205) 633-4300. (Oct '90)

QMS PS-820 turbo $$$

Less expensive and faster than the Apple LaserWriter IINTX, the QMS-PS 820 Turbo is a 300-dpi PostScript printer whose average speeds surpass those of the IINTX by 11 percent and its print quality is as good, if not better. Dual trays. $6,495. QMS, Inc., One Magnum Pass, Mobile, AL 36689. (800) 523-2696 or (205) 633-4300. (May '90)

Seiko CH-5504 $$$

This QuickDraw-based color thermal-wax-transfer printer features good color range, but poor line resolution. It is compact but slow. Can handle a large print area. Bundled with ATM, Plus Pack, and TypeAlign. $7,000 – $9,000. Seiko Instruments USA, Inc., 1150 Ringwood Ct., San Jose, CA 95131. (800) 888-0817 or (408) 922-5800. (May '90)

Sharp JX-730 Color Ink Jet
$$$

This color inkjet QuickDraw-based printer is slow and produces mediocre print quality with low resolution. Color range is good, but it processes only hand-fed paper and does not print transparencies. Can print on large paper sizes. The unit is noisy and shaky. $2,195. Sharp Electronics,

Sharp Plaza, Mahwah, NJ 07430. (201) 529-8200. (May '90)

Tektronix ColorQuick ★★★★
The ColorQuick 216-dpi Quick-Draw inkjet printer is fast enough for everyday use, has a good range of paper-feed options, and provides extremely high resolution for an inkjet printer. Bright, vivid colors are supported by TekColor, Tektronix's screen-to-page-matching process. Requires Mac interface kit. $2,345; Mac interface kit, $150. Tektronix, Inc., P.O. Box 1000, Mail Station 63-630, Wilsonville, OR 97070. (800) 835-6100. (May '90)

Tektronix 4693DX Color Image ★★½
This QuickDraw-based color-thermal-wax-transfer printer boasts a color range that surpasses that of most other printers. Its driver needs improvement. Optional connection to four Macs. Requires Mac interface kit. $8,995; Mac interface kit, $495. Tektronix, Inc., P.O. Box 1000, Mail Station 63-630, Wilsonville, OR 97070. (800) 835-6100. (May '90)

Texas Instruments microLaser PS35 ★★★½
The 33.5-pound, 300-dpi, 6-ppm microLaser PS35 PostScript laser printer consistently surpasses the LaserWriter IINT in terms of speed and image quality. The combination of elegant design and small size make this printer a good value. $2,999. Texas Instruments, 12501 Research Blvd., Austin, TX 78769. (800) 847-2787 or (512) 250-7111. (Oct '90)

Varityper VT600P ★★★
This 600-dpi, 12-ppm industrial-strength PostScript laser printer features exceptional image quality. For straight text output, it's also one of the fastest laser printers available. It's slightly slower than the IINT and IINTX in outputting page-layout documents, because of its 600-dpi resolution. Although pricey, it's a viable unit for producing camera-ready PostScript when less-than-magazine quality is acceptable. $16,995. Varityper, 11 Mt. Pleasant Ave., East Hanover, NJ 07936. (201) 887-8000. (Oct '90)

● **PERFORMANCE ENHANCERS**

Aox DoubleTime-16 ★★★★
This 16-megahertz 68000-based accelerator features low cost, modest performance increase, and simple installation. Good choice for users on a tight budget. For Mac SE. Without FPU, $395; with FPU, $545. Aox, Inc., 486 Totten Pond Rd., Waltham, MA 02154. (800) 232-1269 or (617) 890-4402. (Aug '90)

Apple Macintosh IIci Upgrade ★★★★½
This 25-megahertz 68030-based accelerator boosts the IIcx's performance by a third. Requires 80-nsec or faster RAM SIMMs. For Mac IIcx. $2,399. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Aug '90)

Apple Macintosh IIfx Upgrade ★★★★★
Apple's 40-megahertz 68030-based accelerator board outperforms add-ons for a reasonable cost. Features SRAM cache, fast DMA SCSI. Special IIfx RAM must be purchased (at least 4 megabytes). This accelerator is recommended for best performance for Mac II and IIx owners. Requires 4 megabytes of DRAM. $2,999; with DRAM, $3,998. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Aug '90)

Apple Macintosh IIx Upgrade ★★★
Unlike the IIfx upgrade, this accelerator uses normal Mac II RAM. This pricey 68030 and 68882 upgrade offers PMMU capability and a small speed increase; consider buying a cache card and a PMMU instead. For Mac II. $2,199. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Aug '90)

Apple Macintosh SE/30 Upgrade ★★★★½
The best choice for turbocharging the Mac SE is Apple's SE/30 upgrade, which gives you Macintosh IIx performance. This 16-megahertz 68030-based accelerator board features color QuickDraw, stereo sound, and 8 megabytes of RAM. It's a clear performance winner over other SE-accelerator options, except in maximum speed. FDHD option recommended. For Mac SE. $1,699; with FDHD option, $2,198. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. 800) 776-2333 or (408) 996-1010. (Aug '90)

DayStar FastCache IIci ★★★★½
The FastCache IIci is a speedy upgrade that requires no software. The card fits into the IIci processor-direct slot. It has 64K of 25-nsec static RAM that increases the IIci's performance between 5 and 40 percent. SANE patch provided for extra speed; INIT/cdev provided disables cache. For Mac IIci. $379. DayStar Digital, Inc., 5556 Atlanta Hwy., Flowery Branch, GA 30542. (800) 962-2077 or (404) 967-2077. (Aug '90)

DayStar 25MHz PowerCard 030 II ★★★★
Speed up your Mac II by up to 60 percent with this top-notch full-fledged accelerator board. The IIcx requires a $49 CPU-socket upgrade for soldered-in CPUs. For Mac II, IIx, or IIcx. $1,499;

Without FPU, for IIcx, $1,999. DayStar Digital, Inc., 5556 Atlanta Highway, Flowery Branch, GA 30542. (800) 962-2077 or (404) 967-2077. (Aug '90)

DayStar 33MHz PowerCard 030 II ★★★★
This accelerator is a faster Power-Card for a little more money. Same design and features as 25-megahertz version. For Mac II, IIx, or IIcx. Without FPU, $1,699; for IIcx without FPU, $2,199. DayStar Digital, Inc., 5556 Atlanta Hwy., Flowery Branch, GA 30542. (800) 962-2077 or (404) 967-2077. (Aug '90)

DayStar 40MHz PowerCard 030 II ★★★★
This accelerator is an even faster PowerCard for even more money. Same design and features as 25-megahertz version. For Mac II, IIx, or IIcx. Without FPU, $1,899; for IIcx without FPU, $2,399. DayStar Digital, Inc., 5556 Atlanta Hwy., Flowery Branch, GA 30542. (800) 962-2077 or (404) 967-2077. (Aug '90)

DayStar 50MHz PowerCard 030 II ★★★★
Increase Mac performance by 130 percent with the 50MHz Power-Card 030 II. This board is almost as fast as the IIfx and it uses standard Mac II RAM SIMMs. For Mac II, IIx, or IIcx. $2,599; for IIcx without FPU, $3,099. DayStar Digital, Inc., 5556 Atlanta Hwy., Flowery Branch, GA 30542. (800) 962-2077 or (404) 967-2077. (Aug '90)

Dove MaraThon MSE3 ★★★★
This 68020-based 16-megahertz accelerator features a clean, simple design with few components. Easy to install. A faster 68030 version is available. For Mac SE. Without FPU, $699; with FPU, $999. Dove Computer Corp., 1200 N. 23rd St., Wilmington, NC 28405. (800) 622-7627 or (919) 763-7918. (Aug '90)

Dove MaraThon Racer ★★★★
The MaraThon Racer is an inexpensive and easy way to get more performance from a Mac II. It supplies a cache of 32K of high-speed static RAM that increases performance an average of 15 percent. It can be somewhat difficult to install, because the Mac's CPU 68020 must be moved onto the accelerator board. Supports Mac II. $259. Dove Computer Corp., 1200 N. 23rd St., Wilmington, NC 28405. (800) 622-7627 or (919) 763-7918. (Aug '90)

Dove MaraThon 030/SE30 ★★★½
Simple, small, low-cost accelerator board features 68030 with twice the SE/30's clock speed (32 megahertz). This memory cache must be disabled when you format floppy disks. For Mac SE/30. $799. Dove Computer Corp., 1200 N. 23rd St., Wilmington, NC 28405. (800) 622-7627 or (919)

763-7918. (Aug '90)

Dove MaraThon 030/II ★★★★
This simple, small accelerator board includes a 68030 with twice the Mac II's normal speed (32 megahertz). It gives your Mac a 40 percent increase for a modest price. The memory cache must be disabled when you format floppy disks. For Mac II, IIx. $799. Dove Computer Corp., 1200 N. 23rd St., Wilmington, NC 28405. (800) 622-7627 or (919) 763-7918. (Aug '90)

MacProducts '030 RailGun-25MHz ★★★½
This 25-megahertz 68030-based accelerator features the same basic design as the Novy Quik30/Plus-33MHz. SCSI expansion ports for 128K and 512K Macs, $69. Without FPU, $799; with FPU, $999. MacProducts USA, Inc., 8303 Mopac Expy., #218, Austin, TX 78759. (800) 622-3475 or (512) 343-9441. (Aug '90)

Newer Technology MacSElerator ★★★★
This 16-megahertz 68000-based accelerator is a good value and performed well in our lab tests. For Mac SE. Without FPU, $395; with FPU, $505. Newer Technology, 1117 S. Rock Rd., Wichita, KS 67207. (800) 678-3726 or (316) 685-4904. (Aug '90)

Novy Systems Quik30/Plus-33MHz ★★★½
This accelerator gives you IIci computing power in a Plus. For 128K, 512K, Plus, and SE. SCSI port 128K and 512K Macs, $99. Without FPU, $1,495; with FPU, $1,994. Novy Systems, 1862 Fern Palm Dr., Edgewater, FL 32141. (904) 427-2358. (Aug '90)

Orchid MacSprint II ★★★★
This 25-megahertz 68030-based accelerator is a quick and easy way to speed up your Mac II. Simple upgrade offers moderate increase for little money. A cdev disables cache in case of incompatible software. For Mac II. $229. Orchid Technology, 45365 Northport Loop W., Fremont, CA 94538. (415) 683-0300. (Aug '90)

Radius Accelerator 16 Plus ★★★½
Installation of this 16-megahertz 68020-based accelerator is complex, so it's best left to the dealer. Limited SCSI throughput but Silverlining 5.2 software helps. For Mac Plus. $795; with FPU, $1,095. Radius, Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (Aug '90)

Radius Accelerator 16 SE ★★★★½
This 16-megahertz 68020-based accelerator is simple to install. Easy configuration via the Control Panel or startup dialog box. For Mac SE. Without FPU, $795; with FPU, $1,095. Radius, Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (Aug '90)

Radius Accelerator 25 SE
Like the 16-megahertz Radius accelerator, the 25-megahertz version includes a 68882 FPU for faster performance. Easy configuration via the Control Panel or startup dialog box. For Mac SE. Without FPU, $1,395; with FPU, $1,895. Radius, Inc., 1710 Fortune Dr., San Jose, CA 95131. (800) 227-2795 or (408) 434-1010. (Aug '90)

RasterOps ClearVue/SE
This 68000-based, 16-megahertz accelerator doubles the speed of the SE and provides extra RAM. It requires that the Mac RAM and ROM be relocated to the accelerator. Includes an optional 19-inch, 1,024-x-768-pixel two-page monochrome display and a video interface for two-page monitor or Apple Portrait Display. For SE. RasterOps Corp., 2500 Walsh Ave., Santa Clara, CA 95051. (408) 562-4200. (Aug '90)

Siclone Si3033
This 68030-based, 33.3-megahertz accelerator is a speedy upgrade for the II or IIx. Retains older CPU to allow operation in the original unaccelerated mode. An INIT is provided to ensure proper floppy operation. For Mac II, IIx. Without FPU, $1,799; with FPU, $1,999. Siclone Sales and Engineering, 107 Bonaventura Dr., San Jose, CA 95134. (800) 767-8207 or (408) 263-8207. (Aug '90)

Siclone Si3050
A true speed champ, this 68030-based, 50-megahertz accelerator surpasses all its competition with the exception of the IIfx machine. It gives high performance without the expense of special IIfx RAM. An INIT is provided to ensure proper floppy operation. For Mac II, IIx. Without FPU, $1,799; with FPU, $1,999. Siclone Sales and Engineering, 107 Bonaventura Dr., San Jose, CA 95134. (800) 767-8207 or (408) 263-8207. (Aug '90)

Siclone Turbo SE
Delivering solid 60-percent improvement over SE performance, this 68000-based, 16-megahertz accelerator is a great buy for SE owners. Mac RAM and ROM must be moved to accelerator. Without FPU, $398; with FPU, $796. Siclone Sales and Engineering, 107 Bonaventura Dr., San Jose, CA 95134. (800) 767-8207 or 408) 263-8207. (Aug '90)

Total Systems Gemini 020
This cost-effective 16-megahertz 68020 board can increase Plus performance by 300 percent, but installation is complex. Recommended GemKit option speeds SCSI throughput on the Plus. Can be upgraded to 68030. For 128K, 512K, Plus, SE. SE: $745, with FPU, $935; Plus: $895, with FPU, $1,045. Total Systems Integration,

99 W. 10th Ave., Suite 333, Eugene, OR 97401. (800) 874-2288 or (503) 345-7395. (Aug '90)

Total Systems Gemini 030
This 25-megahertz 68030 accelerator board provides performance increases of up to 500 percent, boosting Plus performance past that of a IIci. It has a built-in PMMU. Installation is complex. GemKit option speeds SCSI throughput on Plus. For 128K, 512K, Plus, SE. SE: $1,695; with FPU, $2,195. Plus: $1,895; with FPU, $2,395. Total Systems Integration, 99 W. 10th Ave., Suite 333, Eugene, OR 97401. (800) 874-2288 or (503) 345-7395. (Aug '90)

Total Systems Voyager 030/33
This 68030-based 33.3-megahertz accelerator, manufactured by Siclone, is identical to the Siclone Si3033. A 50-megahertz version with 50-megahertz FPU is also available. For Mac II, IIx. Without FPU, $1795; with FPU, $1995. Total Systems 99 W. Tenth Ave., Eugene, OR 97401. (800) 874-2288 or (503) 345-7395. (Aug '90)

● PORTABLES

Apple Macintosh Portable
State-of-the-art screen technology and a removable, rechargeable long-lasting battery make this 100-percent-Mac machine a must-have for traveling Mac users. The 15.9-pound, 68000-based Macintosh Portable includes a trackball and a standard keyboard. Maximum battery life is 16 hours. Floppy only, $4,799; floppy and 40-megabyte hard-disk drive, $5,499. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014. (800) 776-2333 or (408) 996-1010. (Sept '90) ★'89 Eddy

Colby SE/30
Providing SE/30 power in a transportable package, this 68030-based, 16.6-pound machine fits under an airline seat. The Colby SE/30 features a supertwist 512-x-342-pixel LCD with contrast and brightness controls, a 68882 math coprocessor, a hard-disk drive, as well as modem options. Maximum battery life is three hours. $5300 with hard disk. Colby Systems, 2991 Alexis Dr., Palo Alto, CA 94304. (415) 941-9090. (Sept '90)

Dynamac SE/30
A heavyweight in terms of power, price, performance, weight, and lots of extras, this 68030-based, 19.1-pound, portable includes a 40-megabyte hard-disk drive, a fax modem, a video card, and a 64K hand-held Sharp Wizard electronic datebook with a Mac interface kit. Its 640-x-400 electroluminescent display offers sharper contrast and clearer legibility than other portable screens

but falls short of matching active-matrix-display sophistication. No battery option. $9,995. Dynamac Computer Products, 555 17th St., Suite 1850, Denver, CO 80202. (303) 296-0606. (Sept '90)

Outbound Laptop System
At 9.4-pounds, this sharp-looking portable is a light alternative to the Macintosh Portable. Unfortunately, Mac Plus or SE ROMs have to be installed in the motherboard. The Outbound Laptop System has a supertwist LCD and three hours' battery life but lacks SCSI connection and ADB. Requires Mac Plus or SE. Floppy-disk only, $2,999; 40-megabyte hard-disk-drive version, $3,999. Outbound Systems, 4840 Pearl E. Circle, Boulder, CO 80301. (303) 786-9200. (Sept '90)

Psion Mobile Computer 400
A forerunner in the notebook-computer category, the 5-pound, Mobile Computer 400 features a standard keyboard, a 640-x-400-pixel display, and an estimated 60 hours' battery life. A proprietary operating system limits the variety of software this computer can use, but a text editor, basic terminal program, and database manager are supplied and more programs are in the works. $1,795. Psion, 118 Echo Lake Rd., Watertown, CT 06795. (203) 274-7521. (July '90)

● TELECOMMUNICATIONS

Anchor Automation 24E5 MacPac
This 2,400-bps modem has average performance. Includes basic but limited software and a good warranty. Requires Mac Plus or later. $339. Anchor Automation, Inc., 20675 Bahama St., Chatsworth, CA 91311. (818) 998-6100. (Jan '91)

Applied Engineering DataLink Express
Slow, limited software hampers this 2,400-bps modem's performance. Includes cable and a good warranty. $249; with fax, $349. Applied Engineering, 3210 Beltline Rd., Dallas, TX 75234. (214) 241-6060. (Jan '91)

Computer Friends Lightspeed 2400LE
The price/performance ratio of this 2,400-bps modem gives it an above-average rating. Throughput for the Lightspeed is not exactly speedy despite the nomenclature. Make sure the right cable (the CBL-124) is included. $159. Computer Friends, Inc., 14250 N.W. Science Park Dr., Portland, OR 97229. (503) 626-2291. (Jan '91)

Global Village TelePort/A300
Small and light, this 2,400-bps modem is excellent for taking on the road. The TelePort doesn't require an external power source or a serial port. Solid performance

at a reasonable price. Requires Mac SE or later. $225 ($149.95 direct from manufacturer). Global Village Communication, 1204 O'Brien Dr., Menlo Park, CA 94025. (415) 329-0700. (Jan '91) ★'90 Eddy

Hayes Microcomputer Products V-series Smartmodem 2400
The Hayes Smartmodem set the standard for superior performance, and it continues to be a market leader. Its software is intuitive. Souped-up compression schemes boost throughput as high as 9,600 bps. $899. Hayes Microcomputer Products, Inc., P.O. Box 105203, Atlanta, GA 30348. (404) 441-1617. (Jan '91)

Intel 2400EX MNP-Macintosh
Intel's 2,400-bps modem has average performance. Includes basic but limited software and a good warranty. Make sure the package includes the right cable. $369. Intel Corp., 5200 N.E. Elam Young Pkwy., Hillsboro, OR 97124. (800) 538-3373 or (503) 538-3373. (Jan '91)

Mirror Technologies DM2405
Mirror Technologies' 2,400-bps modem has average performance but is an excellent value because it is bundled with MicroPhone II 1.5. Upgrading to MicroPhone II 3.0 is only $75. Includes cable. $197. Mirror Technologies, 2644 Patton Rd., Roseville, MN 55113. (800) 654-5294 or (612) 633-4450. (Jan '91)

Prometheus ProModem 2400M Plus
The easy-to-use Prometheus ProModem 2400M Plus is an average performer. It comes bundled with cable and excellent software. $349. Prometheus Products, Inc., 7225 S.W. Bonita Rd., Tigard, OR 97223. (503) 624-0571. (Jan '91)
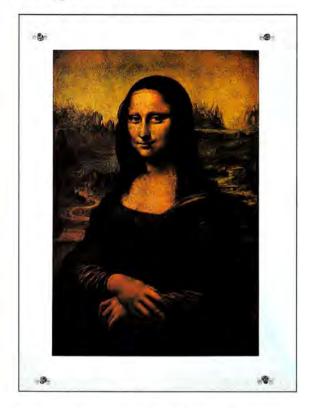
Relisys Tefax RA2110M
The Tefax is a Group 3-compatible stand-alone fax machine with a serial interface that enables it theoretically to act like a fax modem, thermal printer, or 200-dpi scanner. Great idea, but implementation needs a little work. Print quality is low, which means it doesn't really replace a printer or a scanner. The fax machine works fine but lacks a paper cutter. Requires Mac with 1 megabyte of RAM. $1,295. Relisys, 320 S. Milpitas Blvd., Milpitas, CA 95035. (800) 735-4797 or (408) 945-9000. (June '90)

Zoom Telephonics Zoom/Modem V.42bis
The Zoom/Modem V.42bis is a speed champion, offering a truly excellent price/performance ratio and throughput speeds of 9,600 bps. $249; cable, $12. Zoom Telephonics, Inc., 207 South St., Boston, MA 02111. (800) 631-3116 or (617) 423-1072. (Jan '91)

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you can miss the extras that make a product superior. *MacWorld Magazine* has this to say about Third Wave hard drives. *"...Especially quiet,...the quietest of the 64 drives tested...fast—3 of the fastest 12 tested were Third Wave's,...a good bargain."* Quality doesn't just happen. Reliable components and quality control make our products faster, quieter—better.

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Storage Devices

Quantum

		Internal	Standard	Premium
40	18ms (12ms with Cache)	$319	$419	$449
52L	<17ms (<12ms with Cache)	369	469	499
105	18ms (<12ms with Cache)	419	519	549
105L	<17ms (<12ms with Cache)	519	619	649
120	<15ms (<10ms with Cache)	679	779	809
170	<15ms (<10ms with Cache)	749	849	879
210	<15ms (<10ms with Cache)	869	969	999

Seagate

		Internal	Standard	Premium
173	18ms	$999	$1099	$1129
300	16.5ms	1269	1369	1429
330	11ms	1519	1619	1679
330	14ms 3.5"	1599	1699	1729
425	16ms	1699	1799	1829
425	14ms 3.5"	1799	1899	1929
600	16.5ms	1729	1829	1889
650	15.5ms	2199	2299	2369
1000	15ms	2999	3099	3169

Syquest, Tape, DAT, Optical

	Standard	Premium
45R (Syquest, one cart)	$569	$599
45DR (Dual Syquest, two carts)		1099
60t (Teac) w/Retrospect and one tape		569
150t (Teac) w/Retrospect and one tape		679
DATadrive™ 1.3GB WangDAT, w/Retrospect, one tape		1799
OptiDisk™ 600 (Sony) w/one cartridge		3499
OptiDisk™ 1000 (Maxtor) w/one cartridge		4399

Media

Teac CT600H (60mb)	$17
Teac CT600N (150mb)	24
Syquest SQ400	74
4mm DAT Tape	19
Optical Cartridge (ISO/Sony)	159

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1000/DAT	4999
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Classic SIMMPack
　(1, 2.5, 3mb)
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Combo Drives

105/45R	$1049
170/150t	1419
170/DAT	2399
210/DAT	2499
425/45R	2399
425/DAT	3399

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DayStar Powercards	Call
Radius Accelerators	Call
68851 PMMU w/Virtual	179
TI MicroLaser PS35	Call
Seiko ColorPoint PS	Call
Microtek 300ZS Color	1799
Epson ES300C (600 dpi)	1799
Asanté Ethernet Mac II/SE 30	379
Cayman Gatorbox	2049

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364/ 364 Director bundle	949/1299
364 Audio Media bundle	1499
8L-24L Systems	Call
24Si	769
ClearVue II, GS, GS30	Call
Radius Pivot, TPD19, TPD 21	Call
SuperMac Video Systems	Call
Seiko Trinitron 14"	589
Sony 1304 14"	699
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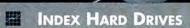
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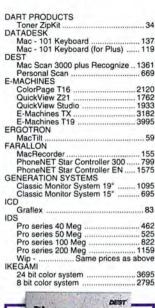
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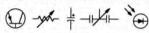
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GRAPHICS
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Let's Spell Mac B-o-r-i-n-g

The Mac world has come to mean big-ticket applications for such things as multimedia, prepress, and animation that most of us will never use. What's left? Not much.

What's happened to the world of the Macintosh? It's become more boring than that of the PC. The Macworld Expo in San Francisco last January closed the lid on the coffin. Everywhere you looked, you saw expensive multimedia applications, pricey typesetting engines, $5,000 monitors. For sure, this stuff makes the Mac a powerful tool for dubious video applications and special applications such as prepress and color separations. So what? I thought spreadsheets were boring. Let's talk mega-boring and discuss color separations.

This is the new direction for the Mac — boring high-end applications for specialists. This is partly the fault of Apple's marketing and strategic-planning departments. Although Apple rolled out three inexpensive Macs to rekindle interest from the "rest of us," it made the move too late to prevent this dangerous turn in direction. It may be too late to prevent a turn in overall public perception.

The irony is that Apple is rumored to have 150,000, maybe more, Mac Classics back-ordered. One showgoer told me he felt sorry for any newcomer to the Mac who attended the Macworld Expo. "Can you imagine some poor schmuck coming to this jammed show and finding that if he wanted to do anything with the Mac, it would cost a fortune!?!"

Even typesetting companies were there showing equipment that costs tens of thousands of dollars. There is nothing exciting about any of this.

Perhaps the Mac has run its course. Its word processors can go no further without turning into desktop-publishing programs that are time-consuming and useful only if you're doing a book or laying out an ad. How many people need this capability? The painting programs have gone as far as they can go. When Radius and the rest of the monitor sellers went to 24-bit color, they hit a brick wall. What next? Have you looked at any of these super-duper painting programs? If you're a professional artist, you'll find them useful. They do everything, especially if you devote your life to them. But how about the rest of us?

It gets worse. There's the dreadfully boring multimedia. I went to a hotel suite and saw videotapes of staid, overproduced, superslick promotions made for corporate clients — the kind of boring, boring video presentations you see at every trade show. Someone is sitting in front of a textured background jabbering about how "when our company switched to Hechstone Electro-Crappers in the bathrooms, employee morale improved dramatically."

A deep voice-over tells the Hechstone story while the video shows all sorts of special effects — such as flying toilets — to accent the imagery. Gads. "It costs us $1,000 to produce this tape, and we charged the client $30,000, and they were glad to pay it," I was told. "This is what multimedia is all about," the man said.

Of course there was only one guy in the company who could make the multimedia engine do all this fancy footwork. And it took special boards and more fancy footwork to get an NTSC master tape out of the Mac. It saved money, but it was boring. The application is boring. The tapes were boring.
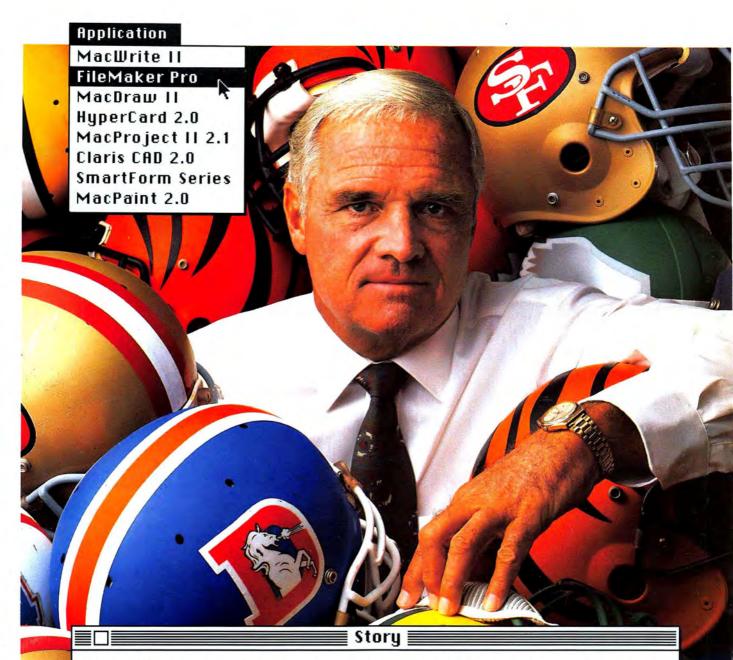
This brings me to another boring type of application that flooded the show and seems to be flooding the pages of Mac magazines: animation programs. Maybe it's just me, but I don't get too excited about animation programs anymore. The first couple I saw I thought were interesting, until I realized I don't want to be an animator.

How many people would ever use an animation program? Not many. Maybe some professional animators and some bored high school kids. That's about it.

Personally, I don't much care. I'd rather job out animation than do it myself. Maybe animation programs help some animators someplace. Maybe they charge less money now. But I doubt it, given the $30,000-and-happy-to-pay gouge those industrial types took for the boring video I just mentioned. Whatever's the case, I'm sure not going to invest the time to learn any of the dozens of animation programs out there.

I've yet to see an animation program that really uses the computer's power. I want one that I can just tell what to do. "Draw a Donald Duck. Draw a red fire hydrant. Have the duck walk to the hydrant. Have him pull it up and throw it to his left." That kind of thing. But why would I want to do this anyway? Again, I'm not an animator. I don't think I'll ever become one. It's boring.

I'm scared this isn't a phase but a trend — the Mac as a humdrum device used to help animators or typesetters or makers of industrial videos. If the enthusiasm dies, so will the Mac. All these applications lack magic, and most can be done on a PC. This doesn't look very exciting to me.

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